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(71) Applicant: CONITA TECHNOLOGIES, INC. [US/US]; 1200 Main Street, Columbia, SC 29201 (US).

(72) Inventors: COOPER, Robert, S.; 354 Hunter's Blind Road, Columbia, SC 29212 (US). MCELROY, Jeff, F.; 2813 Heyward Street, Columbia, SC 29205 (US). ROLANDI, Walter; 3400 Heyward Street, Columbia, SC 27210 (US). SANDERS, Derek; 1412 Charbonneau Drive, Columbia, SC 27206 (US). ULMER, Richard, M.; 1600 Shady Lane, Columbia, SC 27206 (US). PEEBLES, Edward; 318 Guild Hall Drive, Columbia, SC 29212 (US).

(74) Agent: MCFADDEN, Jeffrey, R.; Rhodes & Mason, P.L.L.C., P.O. Box 2974, Greensboro, NC 27402 (US).

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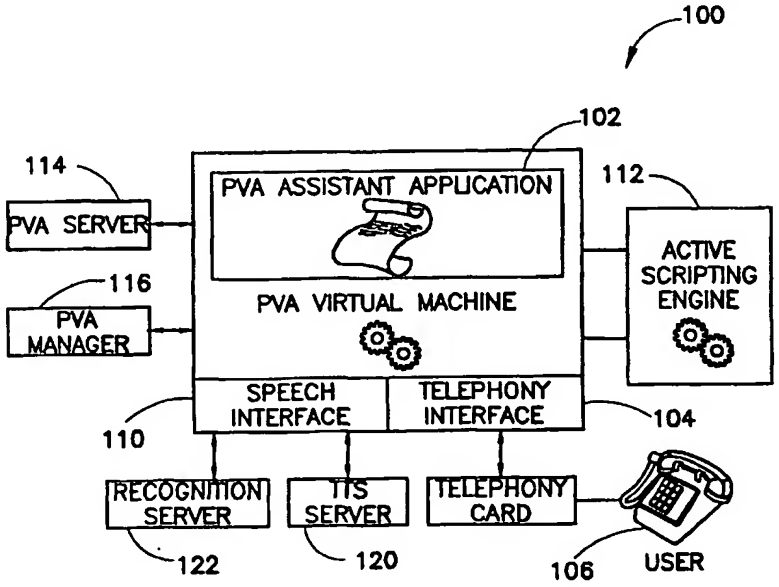
(54) Title: PERSONAL VIRTUAL ASSISTANT



(57) Abstract: A computer-based virtual assistant (100) the behaviour of which can be changed by the user. The virtual assistant comprises a voice user interface for inputing information into and receiving information from the virtual assistant by speech (110), communications network (104), and a virtual assistant application running on a remote computer. The remote computer is electronically coupled to the user interface via the communications network. The virtual assistant changes behaviour responsive to user input. The virtual assistant also automatically adapts its behavior.

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PERSONAL VIRTUAL ASSISTANT

This application is related to PCT Application Serial No. _____, entitled Virtual Assistant Engine, which is filed simultaneously herewith, assigned to a common assignee, and are hereby incorporated by reference.

FIELD OF THE INVENTION

The present invention relates to a computer-based, personal virtual assistant for managing communications and information.

BACKGROUND OF THE INVENTION

Mobile professionals, such as physicians, attorneys, sales representatives and other highly mobile professionals often find it difficult to communicate with clients, customers, colleagues and assistants. These mobile professionals travel frequently and are not accessible via a desk telephone or traditional, wired computer network. They typically employ human assistants to relay important information, maintain their schedules and filter out all unnecessary interruptions. The virtual assistant of the present invention allows the mobile professional to access personal, company, and public information, including contacts, schedules, and databases from any interactive device, such as telephone.

Electronic assistants with voice interfaces are known. U.S. Patent No. 5,653,789 to Miner, et al. discloses a method implemented by a computer-based electronic assistant to receive and manage incoming calls to a subscriber. The electronic assistant in Miner, however, does not disclose a virtual assistant whose underlying behavior can be changed by the user or who has any degree of automatic adaptivity.

Voice response systems (VRS) that automatically adapt to the user are known. For example, U.S. Patent No. 5,483,608 to O'Sullivan discloses an interactive VRS that automatically adapts to suit the speed at which the caller interacts with the system. The VRS disclosed in O'Sullivan is programmed to measure the response times of the caller and adjust the playing speed of the application dialogue's voice messages accordingly using an algorithm incorporated into the application software of the voice response system. Thus, if the caller is responding relatively fast and without error to the voice message prompts, the system will gradually speed up subsequent voice message prompts. If the caller is responding more slowly to the voice message prompts or is making errors in their responses, the system will slow down subsequent voice message prompts. The system disclosed in O'Sullivan, however, does not perform the actions of a virtual assistant, nor does it permit the user to control how the system adapts.

Another caller adaptive VRS is disclosed in U.S. Patent No. 5,553,121 to Martin et al. Martin et al. discloses a system for varying the voice menus and segments presented to the user of a voice response system according to the competence of the user. The response time of a user to voice prompts is measured and an average response time is determined. It is assumed that the lower the average response time, the greater the competence of the user. The average response time is used as an index to a table of ranges of response times. Each range has respective voice segments associated therewith. The voice segments comprise oral instructions or queries for the user and vary according to the anticipated competence of the user. If the average response time changes such that the voice segments indexed are different to the current voice segments then a data base containing information

relating to user competence is updated to reflect such a change. Accordingly, when the user next interacts with the voice response system a new set of voice segments more appropriate to the user's competence will be played. The system in Martin et al. also discloses determining user competence by identifying individual callers using existing caller identification technology. The call identification code of a telephone call can be used as an index to data stored in a user database comprising information relating to the competence of a user. Alternatively, the user can be asked to enter a password before further access is allowed to the system. The password can then serve as an index to the stored data associated with the user. The stored data identifies which set of voice data is appropriate for use during an interaction with said user. Alternatively, determining the number of times per day that a user accesses the system or the length of time which a user has subscribed to such a system may also be indicative of their competence. Again, VRS disclosed in Martin does not perform the functions of a virtual assistant, nor does it permit the use to have any significant degree of control over the behavior of the system.

Further, while the prior art systems adapt automatically to the caller, the degree of adaptation is relatively limited. For example, the prior art systems do not disclose a virtual assistant that automatically uses words associated with polite discourse when the user's input contains words associated with polite discourse. Prior art systems also do not disclose a virtual assistant that adapts to the user based on the user's emotional state.

Another important function provided by a virtual assistant, which is also used ubiquitously by busy professionals who do not have a virtual assistant, is voice mail. Conventional voicemail systems, as well as virtual assistants with voicemail

functionality, however, have disadvantages that limit their usefulness. For example, a professional, such as a physician or an attorney, is a person that many people attempt to contact throughout the day. Such persons, however, cannot for various reasons be reached directly by telephone. Thus, many such professionals have voicemail. If the professional is not able to regularly access his or her voicemail, at the end of the day, or whenever the voicemail is accessed, the number of voicemail messages may be so large so as to be virtually unmanageable because the only option is to listen to the messages one at time in sequential fashion. This can cause the voicemail user to simply abandon use of the voicemail system because the user does not have time to listen to a large number of messages one at a time. This makes it even more difficult for persons attempting to contact the busy professional, the only remaining options being to contact the professional in person, which is impractical, sending a page, sending an email or other know contact methods. If the volume of pages or emails becomes so great, the cycle is repeated.

Navigating large databases of non-messaging information, such as a contacts database is also quite cumbersome and difficult with conventional voicemail systems and virtual assistants, particularly, when the database is large and the user is attempting to access the database with a voice user interface.

U.S. Patent No. 4,488,005 to Frantz discloses a telephone answering system that provide some limited ability for the selective retrieval of messaging information, but Frantz system has several disadvantages. One disadvantage of Frantz is that the user of the answer system is required to manually input the word or words that are to be used later for selective retrieval of the messages. Moreover, the system disclosed in Frantz is limited to retrieval of recorded voice messages. It does not permit

selective retrieval of non-messaging information, such as information in a contacts database or any other electronically accessible database.

U.S. Patent No. 5,558,540 to Greco, et al. discloses a graphical user interface for the display of voice mail messages and playing voice mail messages through a computer speaker. Using a mouse, the messages can be manipulated individually or in groups. The user can listen to the messages in any order at any time. A disadvantage of the system disclosed in Greco et al. is that the user is required to have a personal computer to manipulate the message information.

U.S. Patent No. 5,469,491 to Morley, Jr., et al. discloses a telephone answering system that allows selective retrieval of the messages by dialing an operator DTMF tone to have the recorded textual messages read by the operator and/or activating the playback of the recorded voice messages by inputting appropriate DTMF tones. A disadvantage of the system disclosed in Morley, Jr., et al. is that the user is required to memorize or have access to the proper DTMF tones to selectively retrieve messages.

A conventional computer application with a voice user interface, such as a virtual assistant, needs to ascertain user choices at all junctures where user input is required. Such conversational dialog systems typically ask questions, such as, "Would you like to include a message?" that must be answered by saying "yes" or "no." Alternatively, they provide menus where a number of choices are listed for the user to select, for example, or "Would you like to send your message, review your message, add more to your message or discard your message?" In this case, the user is required to listen to all of the enumerated choices before he or she is able to input his or her choice. The choice can be made by speech or by pressing a particular key

on a telephone keypad. Such systems, however, create artificial interactions, are cumbersome and can be annoying to the user, particularly, the skill and/or impatient user.

In addition, while such conventional systems work reasonably well under good telecommunication conditions, short utterances, however, such as "yes" or "no," can cause speech recognition errors. This is because the short length of the utterance does not always provide sufficient data for accurate speech recognition. Furthermore, when signal quality is bad, as can be the case with wireless communications, speech recognition errors can reach unacceptable levels. Thus, a reliable method for ascertaining user choices under such conditions is needed.

SUMMARY OF INVENTION

The present invention relates to a personal virtual assistant with many discrete features, each of which comprises a separate but related invention. Thus, one aspect of the present invention is a computer-based virtual assistant the behavior of which can be changed by the user, comprising a voice user interface for inputting information into and receiving information from the virtual assistant by speech, a communications network, a virtual assistant application running on a remote computer, the remote computer being electronically coupled to the user interface via the communications network, wherein the behavior of the virtual assistant changes responsive to user input.

Another aspect of the present invention is a computer-based virtual assistant that automatically adapts its behavior comprising a voice user interface for inputting information into and receiving information from the virtual assistant by speech, a communications network, a virtual assistant application running on a remote

computer, the remote computer being electronically coupled to the user interface via the communications network, wherein the remote computer is programmed to automatically change the behavior of the virtual assistant responsive to input received by the virtual assistant. As detailed below, the virtual assistant adapts to the user in many different ways based on the input the virtual assistant receives. Such input could be user information, such as information about the user's experience, the time between user sessions, the amount of time a user pauses when recording a message, the user's emotional state, whether the user uses words associated with polite discourse, and the amount of time since a user provided input to the virtual assistant during a session.

Another aspect of the present invention is a virtual assistant application with a voice user interface that employs the concept of semantically tagging electronic information, such as voicemail messages, email messages, contacts, or any other type of electronically accessible information. Messages, for example, can be tagged with information that the user would find helpful in navigating a large set of messages. The field to be tagged might be status, that is, whether the message is urgent. Voicemail messages also can be tagged based on the sender of the message, which could be determined either by automatic caller identification or by the sender stating his or her name, the delivery date of the message, or the status of the message, that is, whether it has been read. When messages are marked with this semantic information a virtual assistant is able to make use of these tags and present the user with a more organized method of accessing his or her messages.

Another aspect of the present invention is a computer based method for performing a first command via a voice user interface on information stored in a

computer memory, wherein the information upon which the first command is to be performed is comprised of a subset of objects specified by the user, the subset being selected from a set of objects, wherein each object in the set of objects has an object type, at least one taggable field associated with the object type, and a corresponding value for the at least one taggable field. The method is comprised of the steps of storing the set of objects in the computer memory, receiving from the user via the voice user interface an utterance, the utterance being comprised of a first command, an object type selection, a taggable field selection, and a value for the selected taggable field, responsive to the utterance, retrieving a subset of objects from the set of objects, the subset containing at least one object, the at least one object being of the object type selected by the user, having a value in the taggable field selection that matches the taggable field value received from the user, performing the first command on the retrieved subset of objects performed on an active object in the subset of objects, the at least one active object being the object upon which the first command was performed, receiving a second command from the user, the second command to be performed on an active object in the subset of objects, the object being the object upon which the first command was performed, and performing the second command on the active object.

The object type is a voicemail message, email message, meeting request, task request or fax. The taggable field for the voicemail message type is caller's name, callback number, delivery date, subject or status. The taggable field for the email message type is sender, delivery date, subject or status. The taggable field for the meeting request message type is sender, delivery date, subject, location, start time, end time or status. The taggable field for the task request message type is sender,

delivery date, subject, due date, owner, status or percentage complete. The taggable field for the fax message type is selected from the group consisting of telephone number of the machine that sent the fax, sender, delivery date, subject and status. The taggable field value for the status field is first, last, new, old, read, unread, deleted or urgent.

The first command is count, browse, list or read. The second command is next, previous, first, last, read, get more detail, file, delete or restore. The object type also can be a contact, wherein the taggable field is first name, last name or nickname.

Another aspect of the present invention is a computer application with a voice user interface, such as a virtual assistant, that provides a user with choice prompts by speech and permits the user to select the desired choice by indicating his or her selection during the time that the desired choice prompt is being provided by the computer application. In one embodiment, the user indicates his or her desired choice by pressing a predetermined key on a telephone keypad, such as the star ("*") key. In another embodiment, the user indicates his or her desired choice by providing verbal input to the virtual assistant.

Another aspect of the invention is that the user can selectively determine whether to enter a mode of interacting with a computer application with a voice user interface whereby with the users select a desired choice by indicating his or her selection during the time that the desired choice prompt is being provided by the computer application.

Another aspect of the present invention is a method for receiving from a virtual assistant application user a desired choice from a plurality of choices presented to the user by the virtual assistant. The method is comprised of receiving a predefined

input from the user indicating that the user desires to enter a choice prompt mode; providing a choice stream to the user, the choice stream being comprised of at least one choice prompt, the choice prompt being associated with a choice available to the user and the choice prompt being comprised of a recorded utterance, and a corresponding active segment, wherein the user can select the choice associated with the choice prompt during the corresponding active segment; receiving the predefined input from the user during the active segment corresponding to the desired choice prompt, the predefined input that indicating that the user desires to select the choice associated with the choice prompt; performing an action associated with the choice selected by the user; and receiving the predefined input from the user indicating that the user desires to exit the choice prompt mode. The length of the active segment is not less than 200 milliseconds. The input received from the user during the active segment is predefined verbal input, such as the words "yes" and "no." Alternatively, the input is predefined nonverbal input, such as a predefined DTMF. The predetermined DTMF could be the DTMF that is generated by a telephone keypad when the star ("*") key is pressed.

The method is further comprised of the step of providing a predefined audible signal to the user, the audible signal signifying to the user the beginning of a choice stream, prior to the step of providing the choice stream.

The first choice prompt in the choice stream is the choice automatically determined by the virtual assistant to be the choice likely to be selected by the user based on the user's past choices.

Other features and advantages will become apparent based on the following detailed description of the preferred embodiments and the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an overview of the virtual assistant (VA) of the present invention;

FIG. 2 is a diagram of the VA Server;

FIG. 3 is a diagram of the VA Studio;

FIG. 4 is a diagram of the VA Engine conceptual model;

FIG. 5 is a diagram of the VA Manager conceptual model;

FIG. 6 is a screen shot of the Microsoft Management Console for managing the VA Server Manger;

FIG. 7 is a screen shot of a web page that uses Active Server Pages to manage the VA Server Manager;

FIG. 8 is a diagram of the component relationships of a VA Server Set;

FIG. 9 is a diagram of a relatively small VA system;

FIG. 10 is a diagram of a large VA system;

FIG. 11 is a diagram of a very large VA system;

FIG. 12 is a diagram of a hardware configuration for a single ISDN PRI link;

FIG. 13 is a diagram of a hardware configuration for a two ISDN PRI links;

FIG. 14 is a screen shot of the Custom Component Selection screen;

FIG. 15 is a screen shot of GlobalCall Feature Selection screen;

FIG. 16 is a screen shot of the Outlook Feature Selection pane;

FIG. 17 is a screen shot of the VA Management Console;

FIG 18 is of the VA Management Console with the general information form displayed in the right panel;

FIG. 19 is a screen shot of the Add Application Instance Dialog box;

FIG. 20 is a screen shot of the Select TTS Server Dialog box;

FIG. 21 is a screen shot of the Add Recognition Server Dialog box;

FIG. 22 is a screen shot of the Add VA Engine Dialog box;

FIG. 23 is a screen shot of the Set Application File Dialog box;

FIG. 24 is a screen shot of the Add Process Dialog box;

FIG. 25 is a screen shot of the Properties Display Panel for a Resource Manager Service;

FIG. 26 is a screen shot of the Alert Configuration Interface;

FIG. 27 is a screen shot of the TTS Dictionary Display;

FIG. 28 is a screen shot of the Dictionary Entry Dialog box;

FIG. 29 is a screen shot of the Database Manager Panel;

FIG. 30 is a screen shot of the Mailbox Properties Dialog with Virtual Assistant Tab;

FIG. 31 is a screen shot of the General tab on the Virtual assistant Preferences screen;

FIG. 32 is a screen shot of the Phone/Pager Tab on the of the Virtual assistant Preferences screen;

FIG. 33 is a screen shot of the VA Interaction tab on the of the Virtual assistant Preferences screen;

FIG. 34 is a flow chart that illustrates a call flow based on different tempo and assertiveness settings;

FIG. 35 is a screen shot of the Phone Schedule screen;

FIG. 36 is a screen shot of the Virtual assistant Tab; and

FIG. 37 is a diagram of a choice prompt stream with corresponding active segments.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The subheadings used herein are meant only so as to aid the reader and are not meant to be limiting or controlling upon the invention. Generally, the contents of each subheading are readily utilized in the other subheadings.

Overview

Mobile professionals, such as physicians, attorneys, sales representatives and other highly mobile professionals often find it difficult to communicate with clients, customers, colleagues and assistants. These mobile professionals travel frequently and are not accessible via a desk telephone or traditional, wired computer network. They typically employ human assistants to relay important information, maintain their schedules and filter out all unnecessary interruptions. The virtual assistant of the present invention allows the mobile professional to access personal, company, and public information, including contacts, schedules, and databases from any interactive

device, such as telephone.

The virtual assistant ("VA") system of the present invention is comprised of two main components: (1) the VA Server, which is built on a Windows NT telephony server platform, and (2) the VA Studio, which allows skilled information technology professionals to develop VA applications that interface with electronic messaging systems, such as Microsoft Exchange and Lotus Notes. The VA Server is a component of the Service Deployment Environment ("SDE"), which is discussed in more detail below. The VA Studio is a component of the Service Creation Environment ("SCE"), which is also discussed in more detail below.

As shown in Figure 1, the VA Server 10 is comprised of a human interface 12 and a network interface 14 for handling calls and providing automated access to information to corporate 28, private 30 and pubic 32 information repositories and sources. The human interface 12 is comprised of a graphical user interface 22, which may be a web browser, a subscriber (or user) voice user interface 24, generally accessed by a telephone, and a public voice user interface 26. The virtual assistant allows a user to use a voice interactive device, such as a telephone, either wired or wireless, to access and update such information. The VA Server also manages all incoming communications by sorting, prioritizing, and filtering such communications, while providing notice to the user of important messages and events.

VA Server

As seen in Figure 2, a core component of the VA Server 40 is the voice-enabled Virtual Machine 42, which is also referred to as the VA Engine. The VA Engine receives spoken commands, interprets and executes them. The VA Engine supports a COM interface 44, which in turn enables VA applications to provide voice access to network applications.

The VA Engine also supports a telephony interface 46 to voice messaging 52 and private branch exchange systems 54, enabling third-party systems to be integrated with the VA Server.

The VA Server conforms to Windows NT telephony and speech interface specifications. The voice messaging interface 56 supports the VPIM (Voice Profile for Internet Mail) standard, and provides a gateway between proprietary voice

messaging systems and VA Server.

The VA system management services provide operations, administration and maintenance capability (OA&M) 60. The OA&M applications also provide a Simple Network Management Protocol ("SNMP") interface to third party management applications, such as HP Openview and CA Unicenter.

In the preferred embodiment, the VA Server is operable on Windows NT Server, release 4.0 or higher, in both single and multiprocessor configurations. Those skilled in the art, however, recognize that the VA Server can be ported to other computing platforms. Multiple systems may be clustered together to support higher system workloads and fail-safe operation.

VA Application

The VA Application, in the preferred embodiment, is compatible with a messaging server 62, such as Microsoft Exchange/Outlook. The VA's architecture, however, advantageously permits integration with other commercially available and customized messaging applications. The VA Application can be easily modified to satisfy specific requirements of a user. The basic functions of the VA Application include:

Messaging – voice-mail, e-mail, and faxes

Contact Management - scheduling, planning, group calendar, contact and referral organization

Call Control – remote users to perform conference calling and call management; notification and forwarding features allow remote users to be contacted immediately by phone/pager when they receive specific voice-mails, e-mails, faxes, or pages

Internet Applications – users can access and internet via an internet server 64 and obtain public information such as weather, travel, financial, competitive data and news

Intranet Applications – users can remotely access information contained on a corporate network (inside the company firewall) using the VA, for example, customer data, shipping and inventory information, sales reports, and financial data, or any information on a database server 66, including SQL databases such as Oracle or

Informix.

Customer Relationship Management applications – the VA Server integrates with commercially available customer relationship management (CRM) software applications 70, such as Siebel, Pivotal, Sales Logix and Onyx.

VA Studio

As seen in Figure 3, the VA Studio 80 is comprised of a grammar generator 82 and a publishing toolkit 84. The VA Studio allows a user to create, modify and debug applications that run on the VA Server 40 without requiring the user to be skilled in the complexities of the underlying components of the VA Server, such as the speech recognition engine, text to speech engine, switch control and unified messaging.

VA Studio employs a graphical user interface (GUI) application that runs on a Windows NT workstation. It allows developers to create projects, each of which defines a VA application. VA Studio is a multiple document interface (MDI) application that follows the workspace-based model.

The VA Studio follows the Microsoft Component Object Model (COM). VA applications are developed using Active Scripting languages such as VBScript and JScript, thus enabling integration with a variety of third party components. The VA applications created with the VA studio will include voice query to SQL databases, message stores, business logic and mainframe applications.

VA applications are composed of discourses and resources. Discourses are the context of conversations between a user and the VA. Resources are items like voice prompts and dictionaries. A developer can utilize the VA Studio Wizard to generate a "skeleton" VA application template. Application templates consist of packages of predefined discourses and resources. Discourses are the context of conversations between a user and the VA. Resources are items like voice prompts and dictionaries. Once a VA application template is generated, the application is further customized using any supported Active Scripting languages.

After writing the VA application, it is then submitted to the build process. During the build process, VA Studio checks for dialog errors, builds a master intermediate grammar and builds a master lexicon. Once compiled and error-free the application is ready to be published.

When an application is published, it is transported from the VA Studio to the VA Server. The VA Server allows a scripted application to access services such as voice mail, databases, and telephony equipment.

A VA application is created, modified, debugged and tested using the VA Studio. The completed application is then automatically installed and configured to run on the VA Server, which enables the VA application to take incoming calls and provide access to both public and private information.

Platform Overview

An Introduction to Virtual Assistant Applications

A VA application allows a user to manage electronic communications and access his or her business's computer resources through a telephone. Using speech recognition and text-to-speech technology, the VA communicates with callers in spoken English. By calling into the VA on a standard telephone, a user can perform functions such as the following:

- Sending and receiving voice mail messages
- Checking, replying to, and forwarding email messages
- Looking up phone numbers and addresses in an electronic address book
- Accessing information in a company database
- Accessing information on the World Wide Web

In addition, the VA can perform many of the functions of a personal secretary, such as the following:

- Informing the user via pager when new voice and email messages arrive
- Filtering incoming voice mail, email, and pages as instructed by the user
- Automatically dialing phone numbers

In the preferred embodiment, the VA performs the above functions by interfacing with a company's Microsoft Exchange server. This application, in effect, allows users to use their desktop Outlook software over the telephone.

The VA software includes a development platform (the SCE) and run-time platform (the SDE), which can host a variety of different VA's. The SDE provides the core components necessary for the functionality of a VA: a telephony interface,

speech recognition facilities, a text-to-speech engine, interfaces with databases and mail servers, and an administrative framework in which the assistant applications will run. The SCE also includes development tools that programmers can use to create custom VA applications.

VA Platform Components

As discussed above, the VA Platform consists of three main components:

- The Service Deployment Environment (SDE)
- Virtual Assistant Applications
- The Service Creation Environment (SCE)

The function of each of these components can be understood using a World Wide Web analogy. The SDE functions like a web server, providing connections with the network and telephone system, controlling the execution of VA applications, and providing resources such as text-to-speech and voice recognition engines that will be accessed by the applications that run on it.

The VA applications are analogous to web pages, determining the content that will be presented and controlling the interactions with the user. A VA application uses scripting languages such as VBScript, JavaScript, and Perl, so that developers can add significant functionality to a VA, such as performing mathematical calculations, processing text, and calling ActiveX and COM objects.

Just as Microsoft Front Page and Netscape Composer are used to create web pages, the SCE is the development environment used to create the VA applications. The main component of the SCE is the VA Studio application, which is based on the Microsoft Visual Studio paradigm and provides a graphical environment with a variety of tools that can be used to create, debug, and publish applications that are run on the SDE. The SCE also includes a set of COM objects that can be used in applications to perform functions such as checking email, reading from a database, and manipulating sound files.

The SDE Service Processes

The Service Deployment Environment consists of eight processes that run simultaneously and perform the functions necessary to support a VA application. In

the preferred embodiment, each of these SDE components runs as a Windows NT Service or background process.

Although they may all run on the same hardware platform, for large VA implementations the components can be distributed across several servers and communicate over the network. Such distribution can allow, for example, one server to be dedicated to performing voice recognition functions while another supports the VA Engine that actually runs the applications. When multiple VA components are distributed across multiple machines, these machines are collectively termed a *VA server set.*

The VA Engine

As illustrated in Figure 4, the VA Engine 100 is the virtual machine on which a VA application 102 runs. Based on the application's instructions, the VA Engine uses its telephony interface 104 to communicate with the user 106 and its speech interface 110 to recognize speech into text and translate text into speech. The VA Engine connects to an Active Scripting Engine 112 to execute the scripts contained in the VA application, and it also communicates with administrative processes such as the VA Server 114 and VA Manager 116.

In the preferred embodiment, the user is electronically coupled to the virtual assistant application via a public switched telephone network. As can be appreciated by one skilled in the art, the communications network that electronically couples the user interface to the computer on which a virtual assistant application is running could be a packet switched telephone network. Also, the communications network could be a wireless communications network.

A VA Engine process can support user interaction over only one telephone line, but multiple VA Engines can be run simultaneously on a single platform. If the VA platform is connected to more than one telephone line, then a separate VA Engine will be running for each incoming line.

The Text-to-Speech (TTS) Server

The Text-to-Speech Server 120 receives text from other components, translates it into speech (that is, into a sound file), and returns it to the requesting component. This speech translation service is isolated in a separate component to

What is claimed is:

1. A computer-based virtual assistant the behavior of which can be changed by the user, comprising:

a voice user interface for inputting information into and receiving information from the virtual assistant by speech;

a communications network;

a virtual assistant application running on a remote computer, the remote computer being electronically coupled to the user interface via the communications network;

wherein the behavior of the virtual assistant changes responsive to user input.

2. The virtual assistant of claim 1, wherein the user input is a user preference.

3. The virtual assistant of claim 2, wherein the user preference is a tempo setting that controls the verbosity of the virtual assistant.

4. The virtual assistant of claim 2, wherein the user preference is an assertiveness setting that controls whether confirmation from the user is required before the virtual assistant performs a task requested by the user.

5. The virtual assistant of claim 2, wherein the user preference is assertiveness setting that controls whether confirmation from the user is required before the virtual assistant performs a task that the virtual assistant anticipates that the

user will request.

6. The virtual assistant of claim 2, wherein the user preference is a user competence level.

7. The virtual assistant of claim 6, wherein the user competence level is selected from the group consisting of novice, experienced and expert.

8. The virtual assistant of claim 7, wherein the tempo setting changes automatically responsive to a change in the user competence level.

9. The virtual assistant of claim 7, wherein the assertiveness setting changes automatically responsive to a change in the user competence level.

10. The virtual assistant of claim 2, wherein the user preference is a detail setting that controls the amount of detail that the virtual assistant provides the user about an item of information.

11. The virtual assistant of claim 2, wherein the user preference is a notification preference setting that controls the method by which the virtual assistant notifies the user of predetermined events.

12. The virtual assistant of claim 11, wherein the method by which the virtual assistant notifies the user of a predetermined event is selected from the group

consisting of a telephone call, a pager notification, an instant messaging service, a short messaging service, and an email.

13. The virtual assistant of claim 11; wherein the predetermined event of which the user is notified is selected from the group consisting of a reminder for a task, a reminder for an appointment, a reminder for an event, receipt of an email message and receipt of a voice mail message.

14. The virtual assistant of claim 2, wherein the user preference is a telephone call routing setting that controls the routing of a telephone call to the user.

15. The virtual assistant of claim 14, wherein the telephone call routing setting can be configured to route a telephone call to the user to a predetermined telephone number.

16. The virtual assistant of claim 14, wherein the telephone call routing setting can be configured to route a telephone call to the user to a plurality of predetermined numbers, the predetermined number being determined by a predetermined schedule for the user.

17. The virtual assistant of claim 14, wherein the telephone call routing setting can be configured not to disturb the user by not routing telephone calls to the user.

18. The virtual assistant of claim 2, wherein the user preference is a page routing setting that controls the routing of a page to the user.

19. The virtual assistant of claim 18, wherein the page routing setting can be configured to route a page to the user to a predetermined email address.

20. The virtual assistant of claim 18, wherein the page routing setting can be configured to route a page to the user to a plurality of predetermined email addresses, the predetermined email addresses being determined by a predetermined schedule for the user.

21. The virtual assistant of claim 18, wherein the page routing setting can be configured not to disturb the user by not routing a page to the user.

22. The virtual assistant of claim 2, wherein the user preference is a greeting setting.

23. The virtual assistant of claim 22, wherein the greeting setting can be configured so that the virtual assistant communicates to the user information about the number of new messages received by the user.

24. The virtual assistant of claim 19, wherein the new messages received by the user are selected from the group consisting of voice mail messages, email messages, task requests and meeting requests.

25. The virtual assistant of claim 22, wherein the greeting setting can be configured so that the virtual assistant communicates to the user information about the user's appointments that are scheduled for a predetermined period of time.

26. The virtual assistant of claim 22, wherein the greeting setting can be configured so that the virtual assistant communicates to the user information about the user's tasks that are due during a predetermined period of time.

27. The virtual assistant of claim 2, wherein the user preference is an archive message setting that can be configured by the user to specify the location for archiving messages.

28. The virtual assistant of claim 2, wherein the user preference is an operator setting that can be configured by the user to specify a predetermined number to which a caller can be routed.

29. The virtual assistant of claim 2, wherein the user preference is a tips setting that can be configured by the user to enable or disable the providing of hints to the user.

30. The virtual assistant of claim 2, wherein the user preference is a politeness setting that, when enabled, causes the virtual assistant to include words or phrases associated with polite discourse in the output from the virtual assistant.

31. The virtual assistant of claim 30, wherein the words or phrases associated with polite discourse are selected from the group consisting of "please," "thank you," "thanks," "excuse," "pardon," "may I," and "would you mind."

32. The virtual assistant of claim 1, wherein the communications network is a public switched telephone network.

33. The virtual assistant of claim 1, wherein the communications network is a packet switched telephone network.

34. The virtual assistant of claim 1, wherein the communications network is a wireless telecommunications network.

35. A computer-based virtual assistant that automatically adapts its behavior, comprising:

a voice user interface for inputting information into and receiving information from the virtual assistant by speech;

a communications network;

a virtual assistant application running on a remote computer, the remote computer being electronically coupled to the user interface via the communications network;

wherein the remote computer is programmed to automatically change the behavior of the virtual assistant responsive to input received by the

virtual assistant.

36. The virtual assistant of claim 35, wherein the input received by the virtual assistant is comprised of information about the user.

37. The virtual assistant of claim 36, wherein the user information is comprised of information about the user's experience with the virtual assistant.

38. The virtual assistant of claim 37, wherein the user experience information is comprised of the number of times that the user has accessed the virtual assistant.

39. The virtual assistant of claim 38, wherein tips are automatically disabled after the user accesses the virtual assistant a predetermined number of times.

40. The virtual assistant of claim 39, wherein the predetermined number of times is a multiple of the number of tips.

41. The virtual assistant of claim 40, wherein the multiple is between two and ten.

42. The virtual assistant of claim 41, wherein the multiple is three.

43. The virtual assistant of claim 38, wherein the message of the day is

automatically disabled after the user accesses the virtual assistant a predetermined number of times.

44. The virtual assistant of claim 43, wherein the predetermined number of times is a multiple of the number of tips.

45. The virtual assistant of claim 44, wherein the multiple is between two and ten.

46. The virtual assistant of claim 45, wherein the multiple is three.

47. The virtual assistant of claim 38, wherein the virtual assistant automatically provides a prompt to the user in response to which the user can increase the tempo of the virtual assistant, the prompt being provided automatically after the user accesses the virtual assistant a predetermined number of times.

48. The virtual assistant of claim 47, wherein the predetermined number is more than one.

49. The virtual assistant of claim 48, wherein the predetermined number is between ten to thirty.

50. The virtual assistant of claim 49, wherein the predetermined number is twenty.

51. The virtual assistant of claim 38, wherein the virtual assistant automatically increases the tempo of the virtual assistant after the user has accessed the virtual assistant a predetermined number of times.

52. The virtual assistant of claim 51, wherein the predetermined number of times is more than one.

53. The virtual assistant of claim 52, wherein the predetermined number is between ten to thirty.

54. The virtual assistant of claim 53, wherein the predetermined number is twenty.

55. The virtual assistant of claim 38, wherein the virtual assistant automatically provides a prompt to the user in response to which the user can increase the assertiveness of the virtual assistant, the prompt being provided automatically after the user accesses the virtual assistant a predetermined number of times.

56. The virtual assistant of claim 55, wherein the predetermined number is more than one.

57. The virtual assistant of claim 56, wherein the predetermined number is between ten to thirty.

58. The virtual assistant of claim 57, wherein the predetermined number is twenty.

59. The virtual assistant of claim 38, wherein the virtual assistant automatically increases the assertiveness of the virtual assistant after the user has accessed the virtual assistant a predetermined number of times.

60. The virtual assistant of claim 59, wherein the predetermined number of times is more than one.

61. The virtual assistant of claim 60, wherein the predetermined number is between ten to thirty.

62. The virtual assistant of claim 61, wherein the predetermined number is twenty.

63. The virtual assistant of claim 37, wherein the user experience information is comprised of the number of times per day that the user has accessed the virtual assistant.

64. The virtual assistant of claim 63, wherein tips are automatically disabled after the user accesses the virtual assistant a predetermined number of times per day.

65. The virtual assistant of claim 64, wherein the predetermined number is one or more.

66. The virtual assistant of claim 63, wherein the message of the day is automatically disabled after the user accesses the virtual assistant a predetermined number of times per day.

67. The virtual assistant of claim 66, wherein the predetermined number is one or more.

68. The virtual assistant of claim 37, wherein the user experience information is comprised of the amount of time between user sessions.

69. The virtual assistant of claim 68, wherein the tips are automatically disabled during the current user session if the time since that last user session is a predetermined amount of time.

70. The virtual assistant of claim 69, wherein the predetermined amount of time is ten minutes or less.

71. The virtual assistant of claim 68, wherein the message of the day is automatically disabled during the user session if the time since the last user session is a predetermined amount of time.

72. The virtual assistant of claim 71, wherein the predetermined amount of time is ten minutes or less.

73. The virtual assistant of claim 68, wherein time-of-day specific greetings are automatically disabled during the current user session if the time since the last user session is a predetermined amount of time.

74. The virtual assistant of claim 73, wherein the predetermined amount of time is ten minutes or less.

75. The virtual assistant of claim 68, wherein an appointments setting is automatically disabled during the current user session if the time since the last user session is a first predetermined amount of time.

76. The virtual assistant of claim 75, wherein the first predetermined amount of time is ten minutes or less.

77. The virtual assistant of claim 75, wherein the appointments setting, when enabled, causes the virtual assistant provide the user information about the user's appointments for a second predetermined amount of time.

78. The virtual assistant of claim 77, wherein the second predetermined amount of time is one day.

79. The virtual assistant of claim 68, wherein a tasks setting is automatically disabled during the current user session if the time since the last user session is a first predetermined amount of time.

80. The virtual assistant of claim 79, wherein the first predetermined amount of time is ten minutes or less.

81. The virtual assistant of claim 79, wherein the tasks setting, when enabled, causes the virtual assistant provide the user information about the user's tasks that are due for a second predetermined amount of time.

82. The virtual assistant of claim 81, wherein the second predetermined amount of time is one day.

83. The virtual assistant of claim 37, wherein the user experience information is comprised of an amount of time a user pauses during the recording of a message.

84. The virtual assistant of claim 83, wherein the amount of time a user pauses during the recording of a message is the average amount of time a user pauses during the recording of a message.

85. The virtual assistant of claim 83, wherein, if the amount of time a user

pauses is greater than a first predetermined amount of time, the virtual assistant stops recording, provides the user with the option to continue recording and the first predetermined amount of time is automatically increased by a second predetermined amount of time.

86. The virtual assistant of claim 85, wherein the first predetermined amount of time is two seconds.

87. The virtual assistant of claim 85, wherein the second predetermined amount of time is 500 milliseconds.

88. The virtual assistant of claim 37, wherein the user experience information is comprised of whether words associated with polite discourse are included in input received from the user.

89. The virtual assistant of claim 88, wherein the words associated with polite discourse are selected from the group consisting of "please," "thank you," "thanks," "excuse," "pardon," "may I," and "would you mind."

90. The virtual assistant of claim 88, wherein a politeness setting is automatically enabled when the user input includes words associated with polite discourse.

91. The virtual assistant of claim 90, wherein, if the politeness setting is

enabled, the output of the virtual assistant includes words associated with polite discourse.

92. The virtual assistant of claim 91, wherein the words associated with pleasant discourse are selected from the group consisting of "please," "thank you," "thanks," "excuse," "pardon," "may I," and "would you mind."

93. The virtual assistant of claim 36, wherein the user information is comprised of information about the user's emotion.

94. The virtual assistant of claim 93, wherein the information about the user's emotion is selected from the group consisting of voice volume, word choice and speech rate.

95. The virtual assistant of claim 93, wherein a user's emotional state is determined by the virtual assistant based on the information about the user's emotion.

96. The virtual assistant of claim 95, wherein the user's emotional state is selected from the group consisting of calm and angry.

97. The virtual assistant of claim 96, wherein, if the user's emotional state is angry, the output of the virtual assistant automatically includes words associated with submissive discourse.

98. The virtual assistant of claim 99, wherein the words associated with submissive discourse include "sorry," "regret" and "apologize."

99. The virtual assistant of claim 93, wherein the user emotion information is obtained from a current user session.

100. The virtual assistant of claim 99, wherein the user emotion information obtained during the current user session is used in future user sessions.

101. The virtual assistant of claim 36, wherein the user information is comprised of information about the amount of time since the user last provided input to the virtual assistant.

102. The virtual assistant of claim 101, wherein, if the amount of time since the user last provided input to the virtual assistant is a predetermined amount of time, the virtual assistant automatically asks the user if the user wants to perform a predetermined action.

103. The virtual assistant of claim 102, wherein, if the amount of time since the user last provided input to the virtual assistant is a predetermined amount of time, the virtual assistant automatically performs a predetermined action.

104. The virtual assistant of claim 103, wherein, if the amount of time since the user last provided input to the virtual assistant is a predetermined amount of time,

the virtual assistant automatically provides the user a predetermined hint as to an action that can be performed by the virtual assistant.

105. The virtual assistant of claim 103, wherein the predetermined amount of time is fifteen seconds or more.

106. The virtual assistant of claim 35, wherein the communications network is a public switched telephone network.

107. The virtual assistant of claim 35, wherein the communications network is a packet switched telephone network.

108. The virtual assistant of claim 35, wherein the communications network is a wireless telecommunications network.

109. A computer-based virtual assistant the behavior of which can be changed by the user, comprising:

a user interface for inputting information into and receiving information from the virtual assistant;

a communications network;

a virtual assistant application running on a remote computer, the remote computer being electronically coupled to the user interface via the communications network;

wherein the behavior of the virtual assistant changes responsive to user input.

110. The virtual assistant of claim 109, wherein the user interface is a telephone and the user inputs information into and receives information from the virtual assistant via speech.

111. The virtual assistant of claim 109, wherein the user interface is a telephone and the user inputs information into the virtual assistant via DTMF tones and receives information from the virtual assistant via speech.

112. The virtual assistant of claim 109, wherein the user interface is a graphical user interface.

113. The virtual assistant of claim 109, wherein the user interface is a personal digital assistant.

114. The virtual assistant of claim 109, wherein the communications network is a public switched telephone network.

115. The virtual assistant of claim 109, wherein the communications network is a packet switched telephone network.

116. The virtual assistant of claim 109, wherein the communications network is a wireless telecommunications network.

117. A computer-based virtual assistant that automatically adapts its behavior, comprising:

a voice user interface for inputting information into and receiving information from the virtual assistant by speech;

a communications network;

a virtual assistant application running on a remote computer, the remote computer being electronically coupled to the user interface via the communications network;

wherein the remote computer is programmed to automatically change the behavior of the virtual assistant responsive to input received by the virtual assistant.

118. The virtual assistant of claim 117, wherein the user interface is a telephone and the user inputs information into and receives information from the virtual assistant via speech.

119. The virtual assistant of claim 117, wherein the user interface is a telephone and the user inputs information into the virtual assistant via DTMF tones and receives information from the virtual assistant via speech.

120. The virtual assistant of claim 117, wherein the user interface is a graphical user interface.

121. The virtual assistant of claim 117, wherein the user interface is a

personal digital assistant.

122. The virtual assistant of claim 117, wherein the communications network is a public switched telephone network.

123. The virtual assistant of claim 117, wherein the communications network is a packet switched telephone network.

124. The virtual assistant of claim 117, wherein the communications network is a wireless telecommunications network.

125. A computer based method for performing a first command via a voice user interface on information stored in a computer memory, wherein the information upon which the first command is to be performed is comprised of a subset of objects specified by the user, the subset being selected from a set of objects, wherein each object in the set of objects has an object type, at least one taggable field associated with the object type, and a corresponding value for the at least one taggable field, the method comprising the steps of:

storing the set of objects in the computer memory;

receiving from the user via the voice user interface an utterance, the utterance being comprised of a first command, an object type selection, a taggable field selection, and a value for the selected taggable field;

responsive to the utterance, retrieving a subset of objects from the set of objects, the subset containing at least one object, the at least one object

being of the object type selected by the user, having a value in the taggable field selection that matches the taggable field value received from the user; and

performing the first command on the retrieved subset of objects.

126. The method of claim 125, wherein the object type is selected from the group consisting of voicemail message, email message, meeting request, task request and fax.

127. The method of claim 126, wherein the taggable field for the voicemail message type is selected from the group consisting of caller's name, callback number, delivery date, subject and status.

128. The method of claim 127, wherein the taggable field value for the status field is selected from the group consisting of first, last, new, old, read, unread, deleted and urgent.

129. The method of claim 126, wherein the taggable field for the email message type is selected from the group consisting of sender, delivery date, subject and status.

130. The method of claim 129, wherein the taggable field value for the status field is selected from the group consisting of first, last, new, old, read, unread, deleted and urgent.

131. The method of claim 126, wherein the taggable field for the meeting request message type is selected from the group consisting of sender, delivery date, subject, location, start time, end time, and status.

132. The method of claim 131, wherein the taggable field value for the status field is selected from the group consisting of first, last, new, old, read, unread, deleted and urgent.

133. The method of claim 126, wherein the taggable field for the task request message type is selected from the group consisting of sender, delivery date, subject, due date, owner, status and percentage complete.

134. The method of claim 133, wherein the taggable field value for the status field is selected from the group consisting of first, last, new, old, read, unread, deleted and urgent.

135. The method of claim 126, wherein the taggable field for the fax message type is selected from the group consisting of telephone number of the machine that sent the fax, sender, delivery date, subject and status.

136. The method of claim 135, wherein the taggable field value for the status field is selected from the group consisting of first, last, new, old, read, unread, deleted and urgent.

137. The method of claim 125, wherein the first command is selected from the group consisting of count, browse, list and read.

138. The method of claim 125, wherein the object type is a contact.

139. The method of claim 138, wherein the taggable field is selected from the group consisting of first name, last name and nickname.

140. The method of claim 138, wherein the first command is selected from the group consisting of count, browse, list and read.

141. The method of claim 125, further including the step of:

receiving a second command from the user, the second command to be performed on an active object in the subset of objects, the at least one active object being the object upon which the first command was performed ; and

performing the second command on the active object.

142. The method of claim 141, wherein the second command is selected from the group consisting of next, previous, first, last, read, get more detail, file, delete and restore.

143. A computer readable medium containing instructions for controlling a

computer system to perform a first command via a voice user interface on information stored in a computer memory, wherein the information upon which the first command is to be performed is comprised of a subset of objects specified by the user, the subset being selected from a set of objects, wherein each object in the set of objects has an object type, at least one taggable field associated with the object type, and a corresponding value for the at least one taggable field, by:

storing the set of objects in the computer memory;

receiving from the user via the voice user interface an utterance, the utterance being comprised of a first command, an object type selection, a taggable field selection, and a value for the selected taggable field;

responsive to the utterance, retrieving a subset of objects from the set of objects, the subset containing at least one object, the at least one object being of the object type selected by the user, having a value in the taggable field selection that matches the taggable field value received from the user; and

performing the first command on the retrieved subset of objects.

144. A computer readable medium containing instructions for controlling a computer system to perform a first command via a voice user interface on information stored in a computer memory, wherein the information upon which the first command is to be performed is comprised of a subset of objects specified by the user, the subset being selected from a set of objects, wherein each object in the set of objects has an object type, at least one taggable field associated with the object type, and a corresponding value for the at least one taggable field, by:

storing the set of objects in the computer memory;

receiving from the user via the voice user interface an utterance, the utterance being comprised of a first command, an object type selection, a taggable field selection, and a value for the selected taggable field;

responsive to the utterance, retrieving a subset of objects from the set of objects, the subset containing at least one object, the at least one object being of the object type selected by the user, having a value in the taggable field selection that matches the taggable field value received from the user;

performing the first command on the retrieved subset of objects;

receiving a second command from the user, the second command to be performed on an active object in the subset of objects, the at least one active object being the object upon which the first command was performed; and

performing the second command on the active object.

145. A method for receiving from a virtual assistant application user a desired choice from a plurality of choices presented to the user by the virtual assistant, comprised of:

providing a choice stream to the user, the choice steam being comprised of at least one choice prompt, the choice prompt being associated with a choice available to the user and the choice prompt being comprised of a recorded utterance, and a corresponding active segment, wherein the user can select the choice associated with the choice prompt during the

corresponding active segment;

receiving input from the user during the active segment corresponding to the desired choice prompt, the input that indicating that the user desires to select the choice associated with the choice prompt; and

performing an action associated with the choice selected by the user.

146. The method of claim 145, further comprising the following step prior to the step of providing a choice stream:

receiving a predefined input from the user indicating that the user desires to enter a choice prompt mode.

147. The method of claim 146, further comprising the step of:

receiving the predefined input from the user indicating that the user desires to exit the choice prompt mode.

148. The method of claim 145, further comprising the following step prior to the step of providing the choice stream:

providing a predefined audible signal to the user, the audible signal signifying to the user the beginning of a choice stream.

149. The method of claim 145, wherein the length of the active segment is not less than 200 milliseconds.

150. The method of claim 145, wherein first choice prompt in the choice

stream is the choice automatically determined by the virtual assistant to be the choice likely to be selected by the user.

151. The method of claim 150, wherein the choice likely to be selected by the user is automatically determined by the virtual assistant based on the user's past choices.

152. The method of claim 145, further comprising the following step prior to the step of performing the action:

repeating the choices in the choice stream until the user selects one of the choices in the choice stream.

153. The method of claim 145, wherein the input received from the user during the active segment is predefined verbal input.

154. The method of claim 153, wherein the predefined verbal input is selected from the group of words consisting of "yes" and "no."

155. The method of claim 145, wherein the input received from the user during the active segment is predefined nonverbal input.

156. The method of claim155, wherein the predefined nonverbal input is a predefined DTMF.

157. The method of claim 156, wherein the predetermined DTMF is the DTMF generated by a telephone keypad with the star key is pressed.

158. A method for receiving from a virtual assistant application user a desired choice from a plurality of choices presented to the user by the virtual assistant, comprised of:

receiving a predefined input from the user indicating that the user desires to enter a choice prompt mode;

providing a choice stream to the user, the choice steam being comprised of at least one choice prompt, the choice prompt being associated with a choice available to the user and the choice prompt being comprised of a recorded utterance, and a corresponding active segment, wherein the user can select the choice associated with the choice prompt during the corresponding active segment;

receiving the predefined input from the user during the active segment corresponding to the desired choice prompt, the predefined input that indicating that the user desires to select the choice associated with the choice prompt;

performing an action associated with the choice selected by the user; and

receiving the predefined input from the user indicating that the user desires to exit the choice prompt mode.

159. The method of claim 158, further comprising the following step prior to the step of providing the choice stream:

providing a predefined audible signal to the user, the audible signal signifying to the user the beginning of a choice stream.

160. The method of claim 145, wherein the length of the active segment is not less than 200 milliseconds.

161. The method of claim 158, wherein first choice prompt in the choice stream is the choice automatically determined by the virtual assistant to be the choice likely to be selected by the user.

162. The method of claim 161, wherein the choice likely to be selected by the user is automatically determined by the virtual assistant based on the user's past choices.

163. The method of claim 158, wherein the input received from the user during the active segment is predefined verbal input.

164. The method of claim 163, wherein the predefined verbal input is selected from the group of words consisting of "yes" and "no."

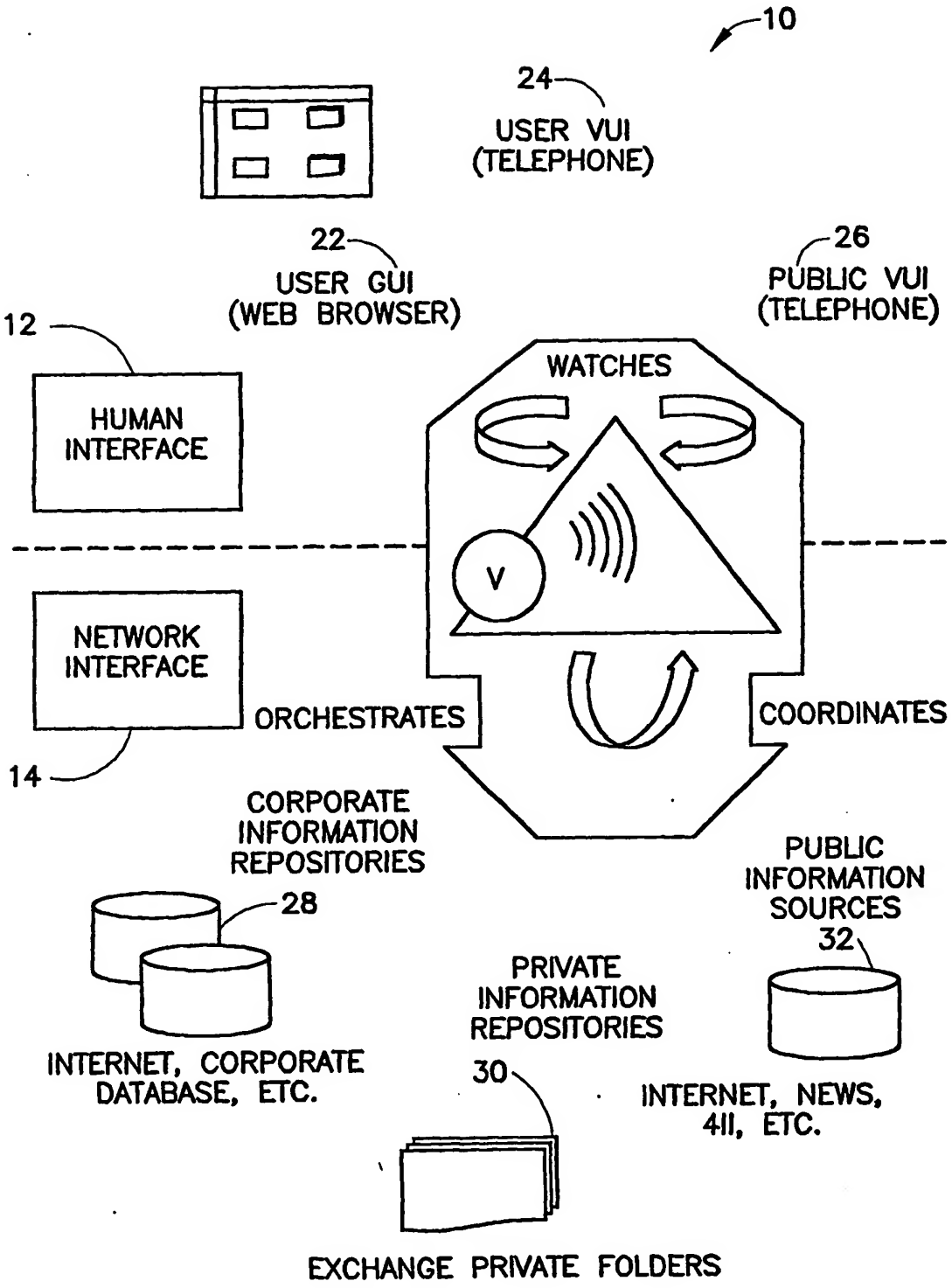
165. The method of claim 158, wherein the input received from the user during the active segment is predefined nonverbal input.

166. The method of claim 165, wherein the predefined nonverbal input is a

predefined DTMF.

167. The method of claim 166, wherein the predetermined DTMF is the DTMF generated by a telephone keypad with the star key is pressed.

5


10
24
USER VUI
(TELEPHONE)
22
USER GUI
(WEB BROWSER)
26
PUBLIC VUI
(TELEPHONE)
12
HUMAN
INTERFACE
WATCHES
V
NETWORK
INTERFACE
14
ORCHESTRATES
COORDINATES
CORPORATE
INFORMATION
REPOSITORIES
28
INTERNET, CORPORATE
DATABASE, ETC.
PUBLIC
INFORMATION
SOURCES
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INTERNET, NEWS,
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PRIVATE
INFORMATION
REPOSITORIES
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EXCHANGE PRIVATE FOLDERS

FIG. 1

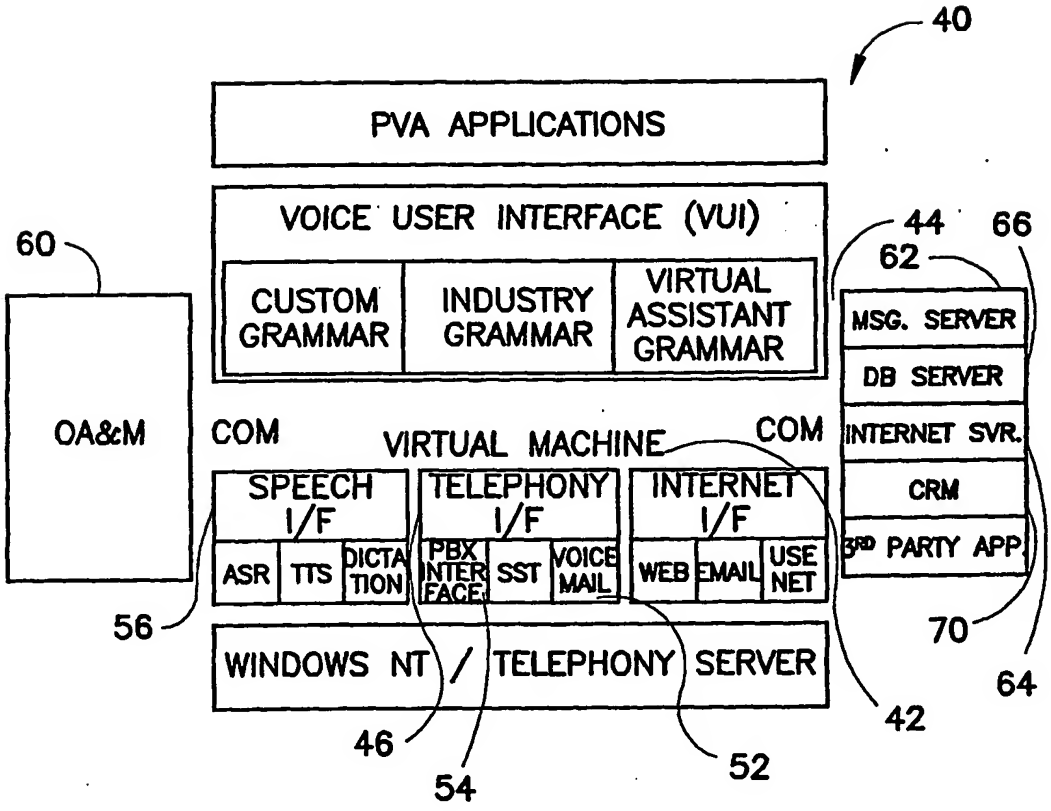

40
PVA APPLICATIONS
VOICE USER INTERFACE (VUI)
CUSTOM GRAMMAR
INDUSTRY GRAMMAR
VIRTUAL ASSISTANT GRAMMAR
60
OA&M
COM
VIRTUAL MACHINE
COM
SPEECH I/F
ASR
TTS
DICTATION
TELEPHONY I/F
PBX INTERFACE
SST
VOICE MAIL
INTERNET I/F
WEB
EMAIL
USENET
WINDOWS NT / TELEPHONY SERVER
44
66
62
MSG. SERVER
DB SERVER
INTERNET SVR.
CRM
3RD PARTY APP
56
70
64
42
46
54
52

FIG. 2

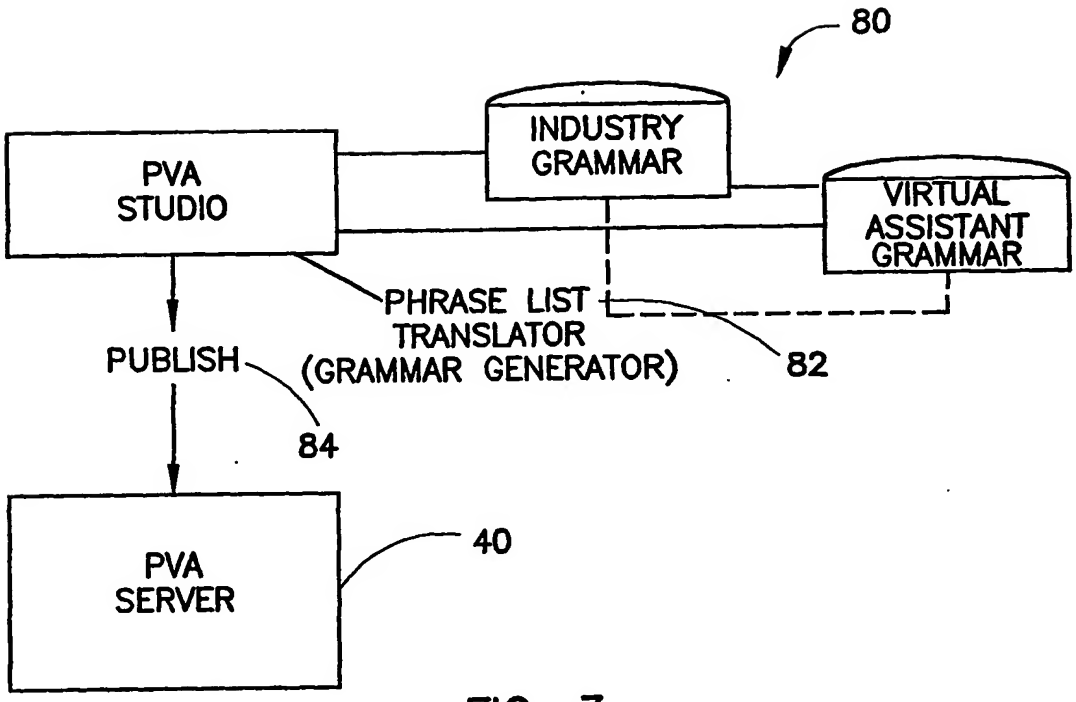

80
INDUSTRY GRAMMAR
PVA STUDIO
VIRTUAL ASSISTANT GRAMMAR
PHRASE LIST TRANSLATOR (GRAMMAR GENERATOR)
82
PUBLISH
84
PVA SERVER
40

FIG. 3

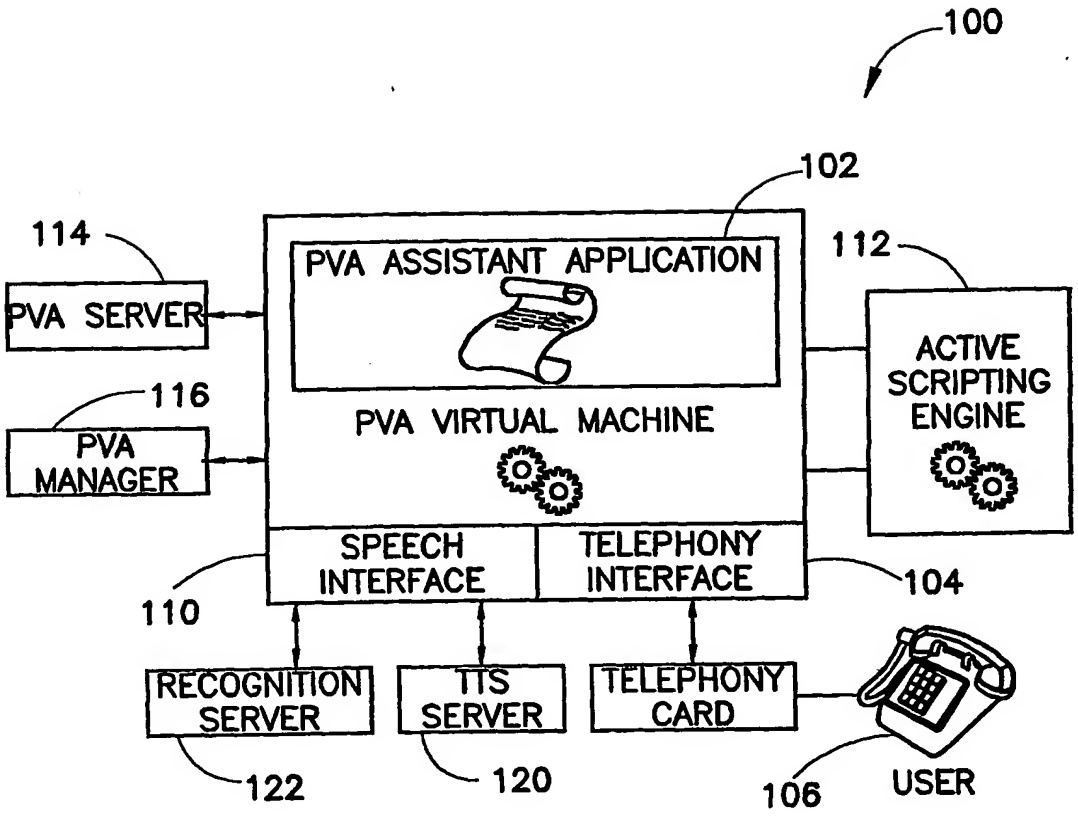

100
102
114
PVA SERVER
PVA ASSISTANT APPLICATION
112
ACTIVE SCRIPTING ENGINE
116
PVA MANAGER
PVA VIRTUAL MACHINE
SPEECH INTERFACE
TELEPHONY INTERFACE
110
104
RECOGNITION SERVER
TTS SERVER
TELEPHONY CARD
122
120
106
USER

FIG. 4

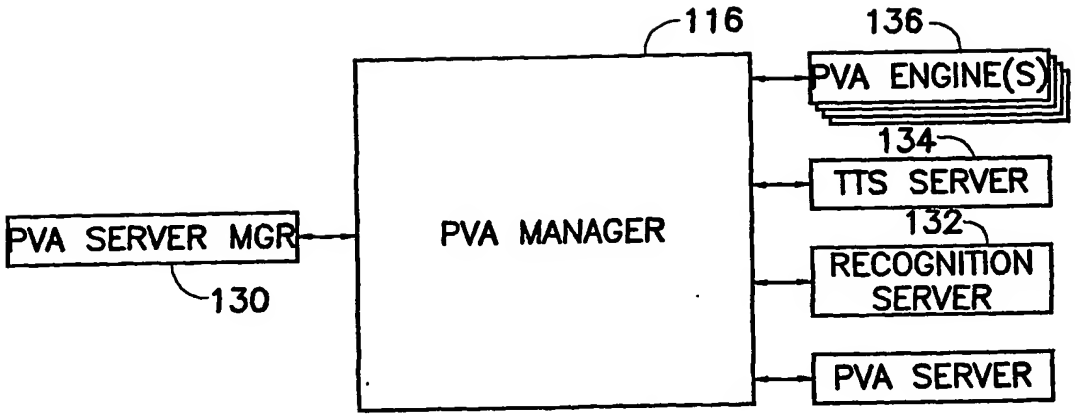
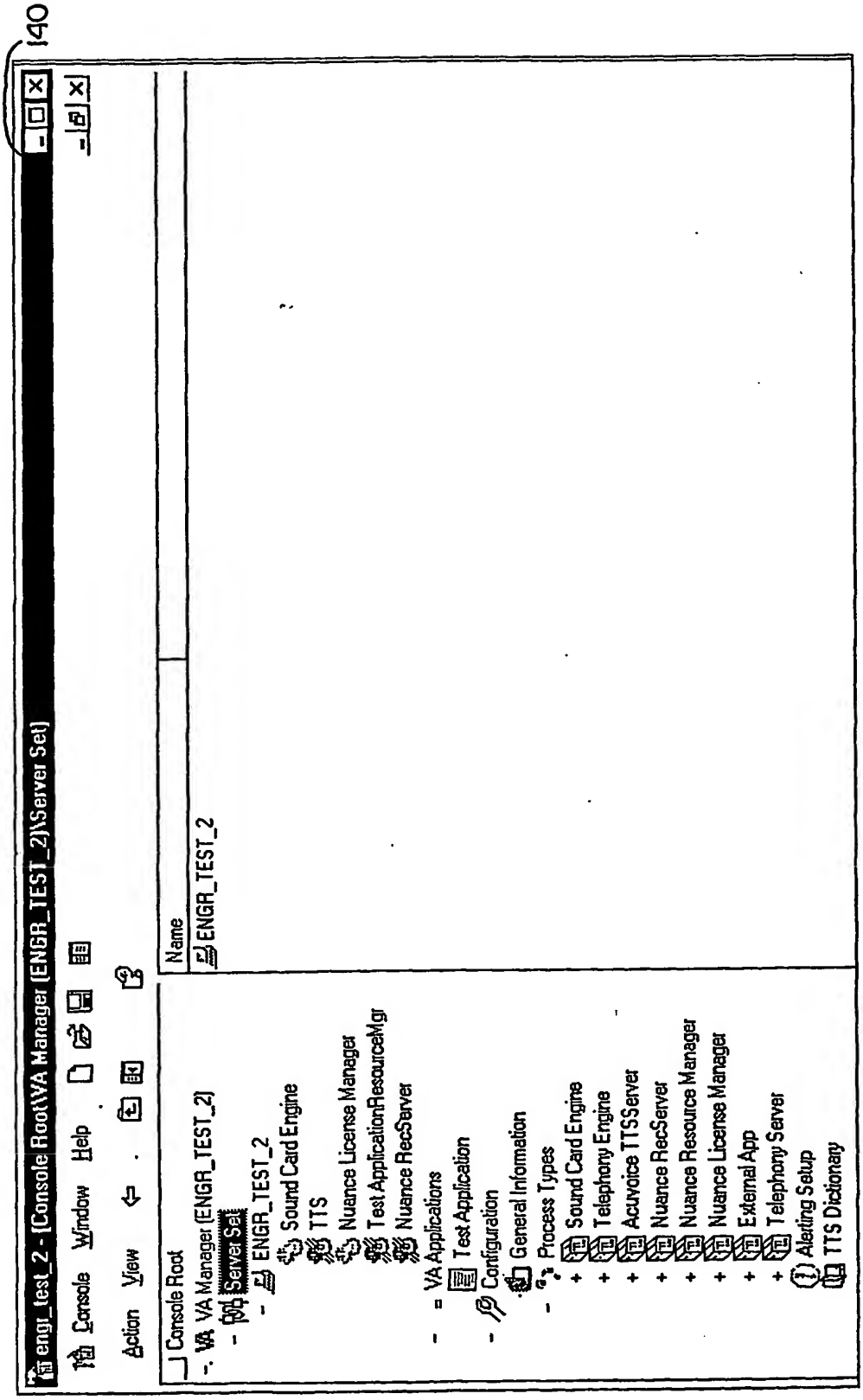

116
136
PVA ENGINE(S)
134
TTS SERVER
132
RECOGNITION SERVER
PVA SERVER
PVA SERVER MGR
130
PVA MANAGER

FIG. 5


140
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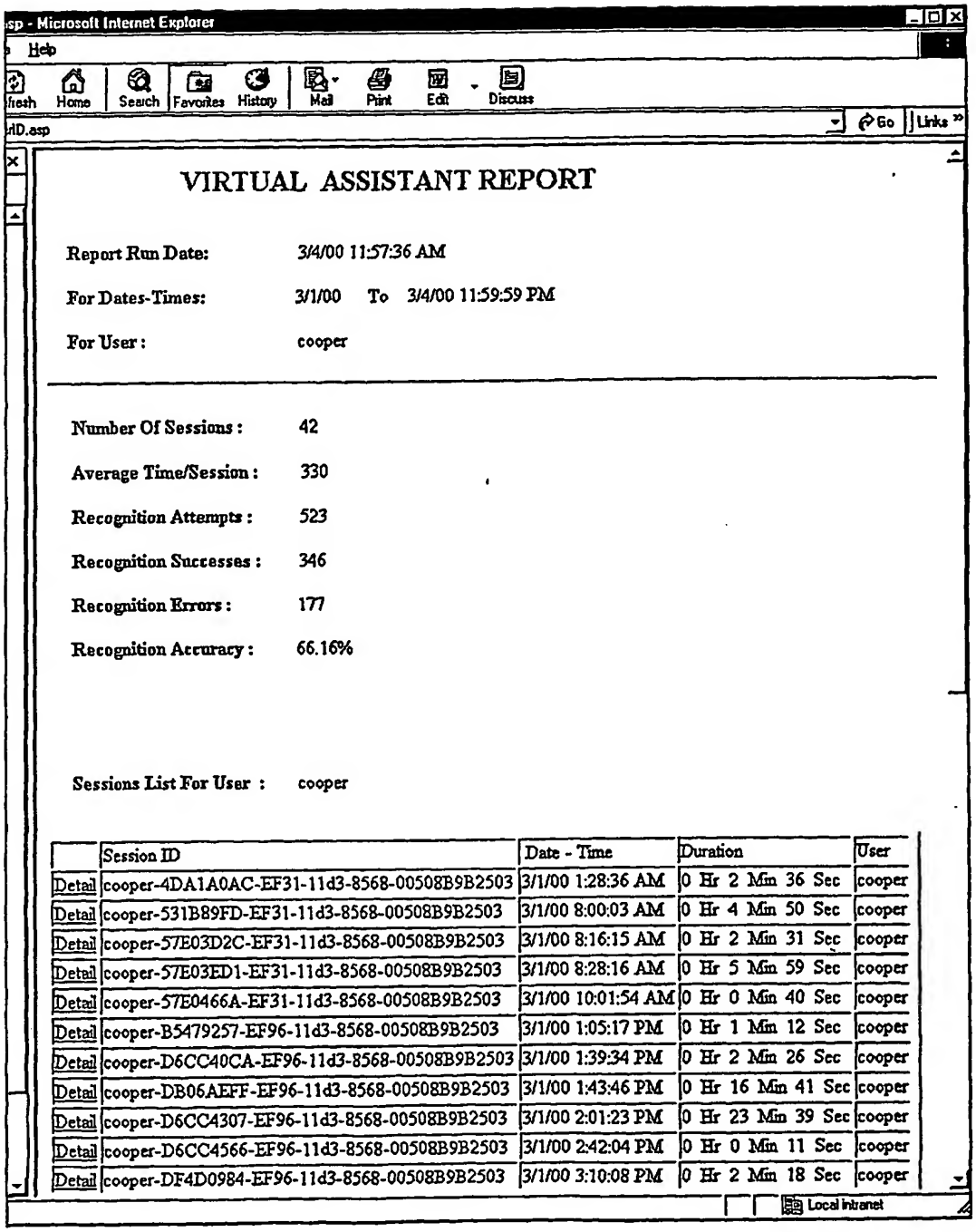
Action View
Console Root
VA Manager (ENGR_TEST_2)
Server Set
ENGR_TEST_2
Sound Card Engine
TTS
Nuance License Manager
Test ApplicationResourceMgr
Nuance RecServer
VA Applications
Test Application
Configuration
General Information
Process Types
Sound Card Engine
Telephony Engine
Acuvoice TTSServer
Nuance RecServer
Nuance Resource Manager
Nuance License Manager
External App
Telephony Server
Alerting Setup
TTS Dictionary
Name
ENGR_TEST_2

FIG. 6

FIG. 7



	Session ID	Date - Time	Duration	User
Detail	cooper-4DA1A0AC-EF31-11d3-8568-00508B9B2503	3/1/00 1:28:36 AM	0 Hr 2 Min 36 Sec	cooper
Detail	cooper-531B89FD-EF31-11d3-8568-00508B9B2503	3/1/00 8:00:03 AM	0 Hr 4 Min 50 Sec	cooper
Detail	cooper-57E03D2C-EF31-11d3-8568-00508B9B2503	3/1/00 8:16:15 AM	0 Hr 2 Min 31 Sec	cooper
Detail	cooper-57E03ED1-EF31-11d3-8568-00508B9B2503	3/1/00 8:28:16 AM	0 Hr 5 Min 59 Sec	cooper
Detail	cooper-57E0466A-EF31-11d3-8568-00508B9B2503	3/1/00 10:01:54 AM	0 Hr 0 Min 40 Sec	cooper
Detail	cooper-B5479257-EF96-11d3-8568-00508B9B2503	3/1/00 1:05:17 PM	0 Hr 1 Min 12 Sec	cooper
Detail	cooper-D6CC40CA-EF96-11d3-8568-00508B9B2503	3/1/00 1:39:34 PM	0 Hr 2 Min 26 Sec	cooper
Detail	cooper-DB06AEFF-EF96-11d3-8568-00508B9B2503	3/1/00 1:43:46 PM	0 Hr 16 Min 41 Sec	cooper
Detail	cooper-D6CC4307-EF96-11d3-8568-00508B9B2503	3/1/00 2:01:23 PM	0 Hr 23 Min 39 Sec	cooper
Detail	cooper-D6CC4566-EF96-11d3-8568-00508B9B2503	3/1/00 2:42:04 PM	0 Hr 0 Min 11 Sec	cooper
Detail	cooper-DF4D0984-EF96-11d3-8568-00508B9B2503	3/1/00 3:10:08 PM	0 Hr 2 Min 18 Sec	cooper

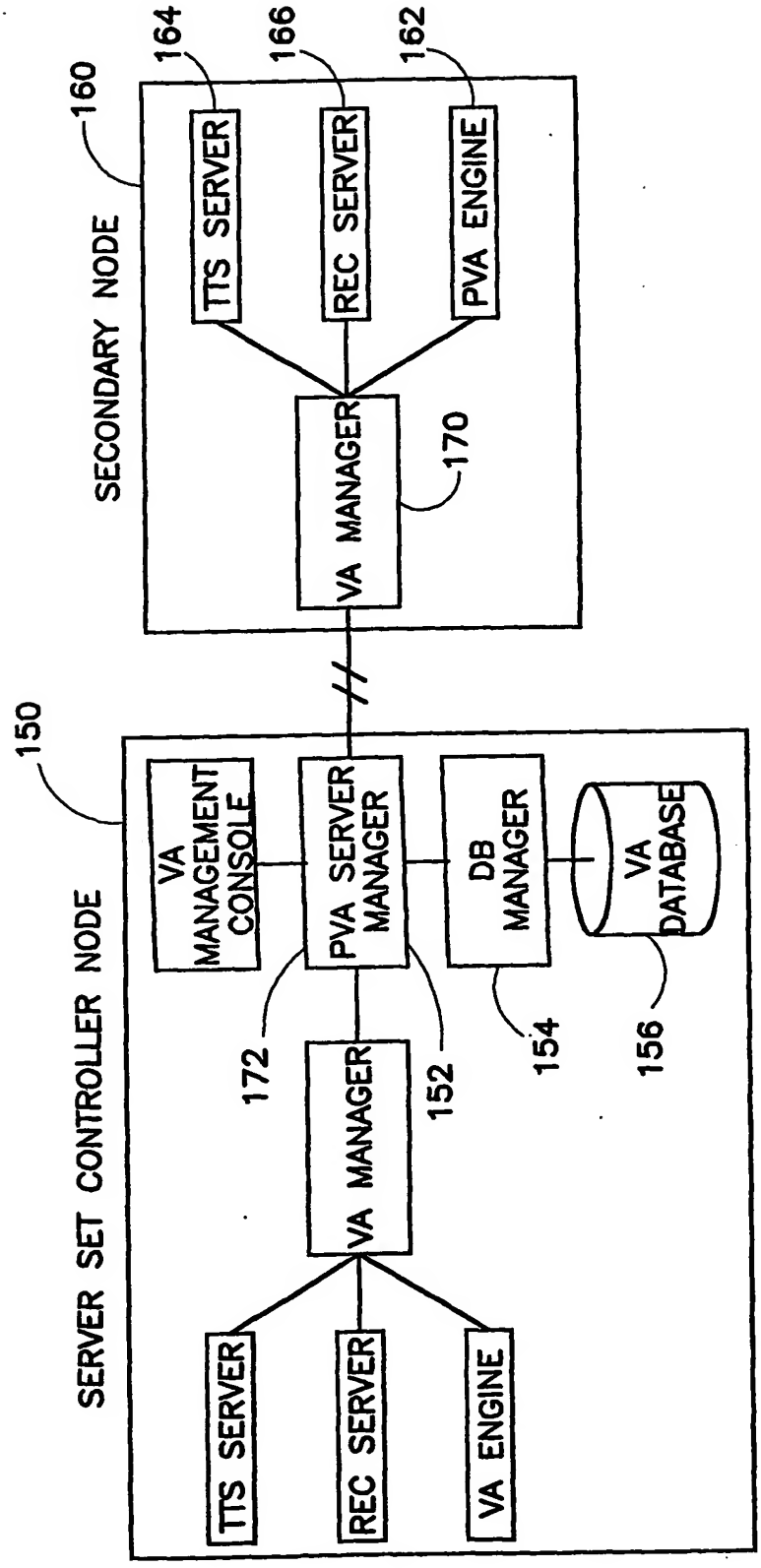

SECONDARY NODE
160
164
166
162
TTS SERVER
REC SERVER
PVA ENGINE
VA MANAGER
170
150
SERVER SET CONTROLLER NODE
VA MANAGEMENT CONSOLE
PVA SERVER MANAGER
DB MANAGER
VA DATABASE
172
152
154
156
VA MANAGER
TTS SERVER
REC SERVER
VA ENGINE

FIG. 8

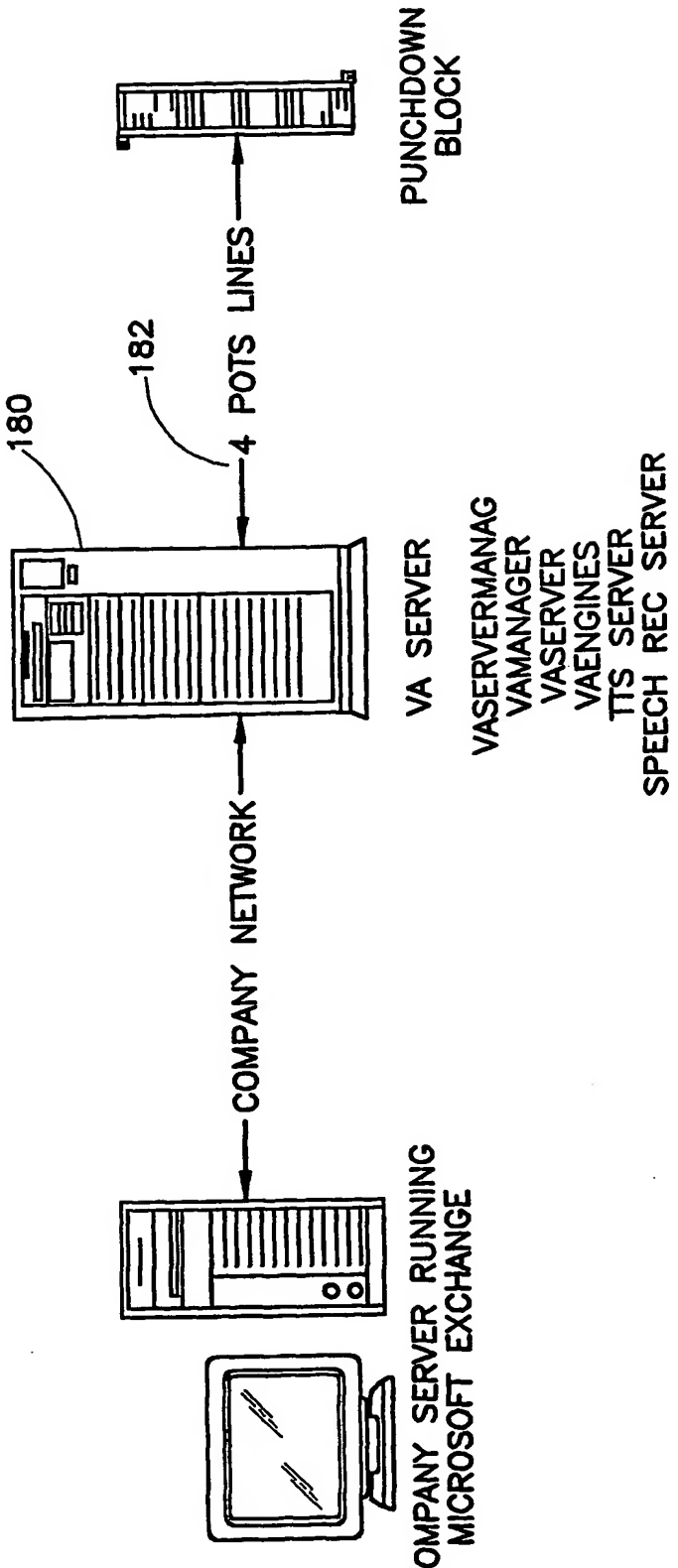

PUNCHDOWN BLOCK
4 POTS LINES
182
180
VA SERVER
VASERVERMANAG
VAMANAGER
VASERVER
VAENGINES
TTS SERVER
SPEECH REC SERVER
COMPANY NETWORK
COMPANY SERVER RUNNING MICROSOFT EXCHANGE

FIG. 9

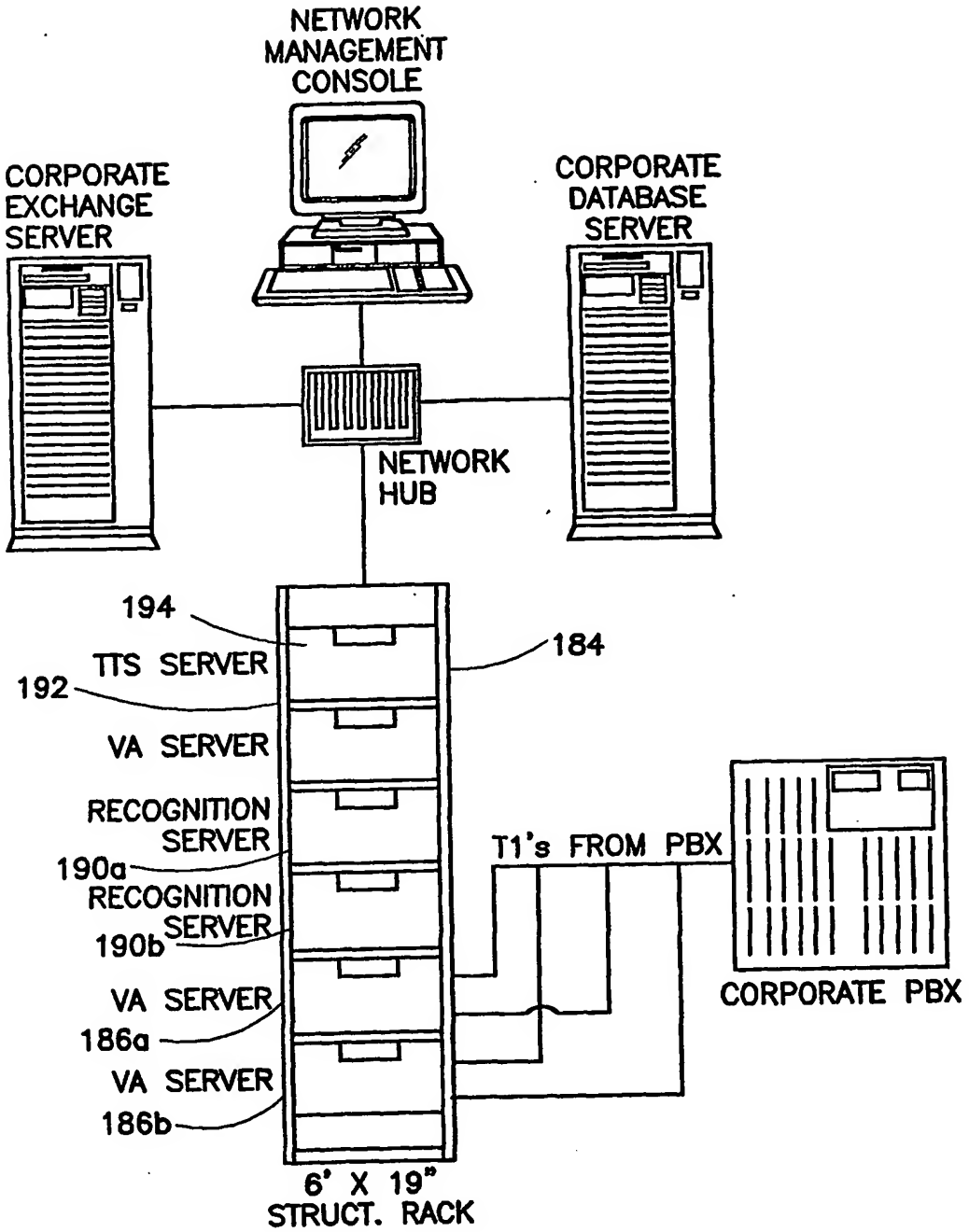

NETWORK MANAGEMENT CONSOLE
CORPORATE EXCHANGE SERVER
CORPORATE DATABASE SERVER
NETWORK HUB
194
184
TTS SERVER
192
VA SERVER
RECOGNITION SERVER
190a
RECOGNITION SERVER
190b
VA SERVER
186a
VA SERVER
186b
T1's FROM PBX
CORPORATE PBX
6' X 19" STRUCT. RACK

FIG. 10

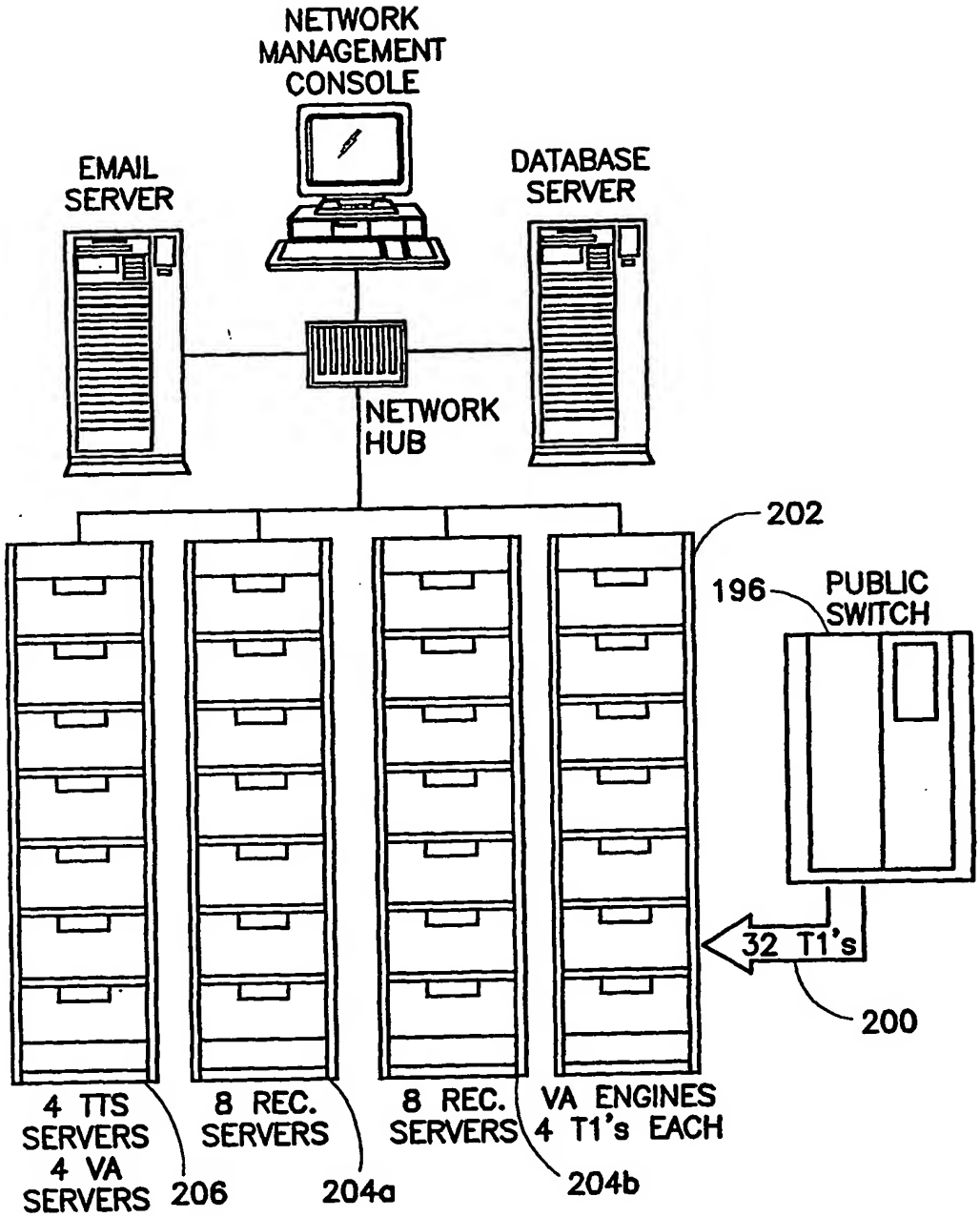

NETWORK MANAGEMENT CONSOLE
EMAIL SERVER
DATABASE SERVER
NETWORK HUB
202
196
PUBLIC SWITCH
32 T1's
200
4 TTS SERVERS 4 VA SERVERS
206
8 REC. SERVERS
204a
8 REC. SERVERS
VA ENGINES 4 T1's EACH
204b

FIG. 11

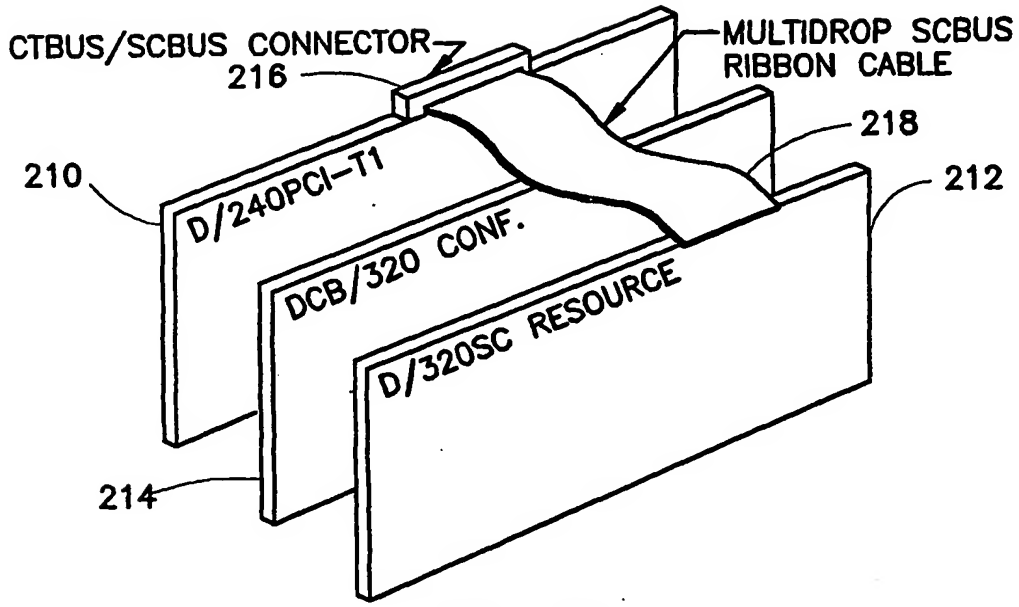

CTBUS/SCBUS CONNECTOR
216
MULTIDROP SCBUS
RIBBON CABLE
218
210
212
D/240PCI-T1
DCB/320 CONF.
D/320SC RESOURCE
214

FIG. 12

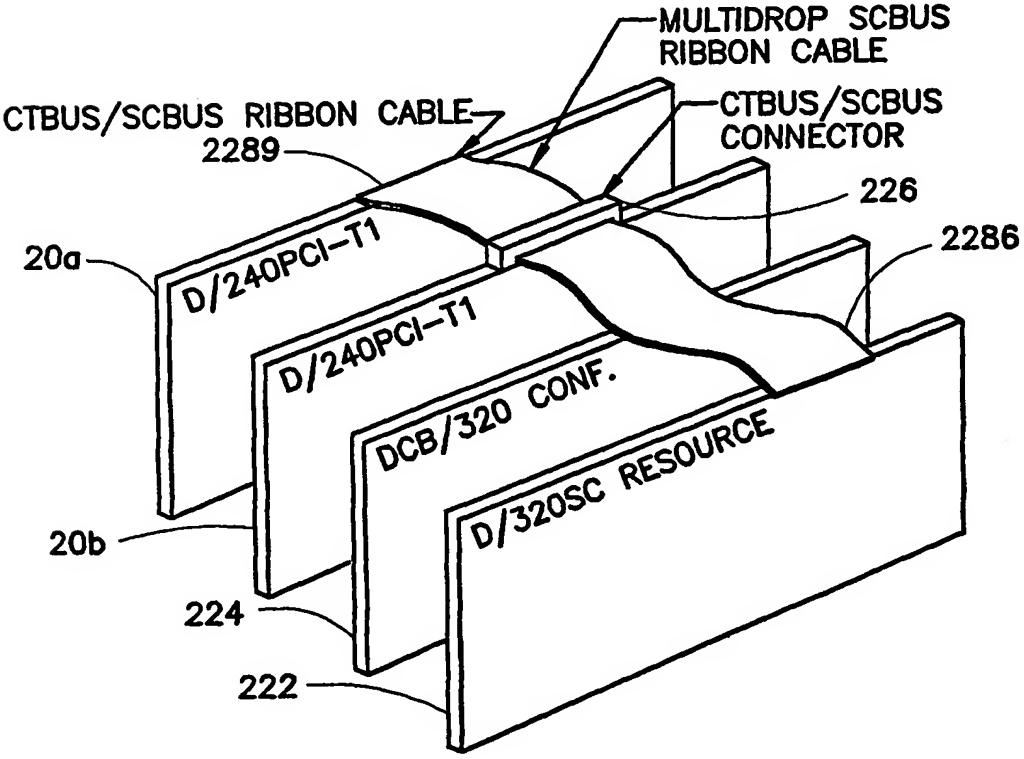

MULTIDROP SCBUS
RIBBON CABLE
CTBUS/SCBUS RIBBON CABLE
2289
CTBUS/SCBUS
CONNECTOR
226
2286
20a
D/240PCI-T1
D/240PCI-T1
DCB/320 CONF.
D/320SC RESOURCE
20b
224
222

FIG. 13

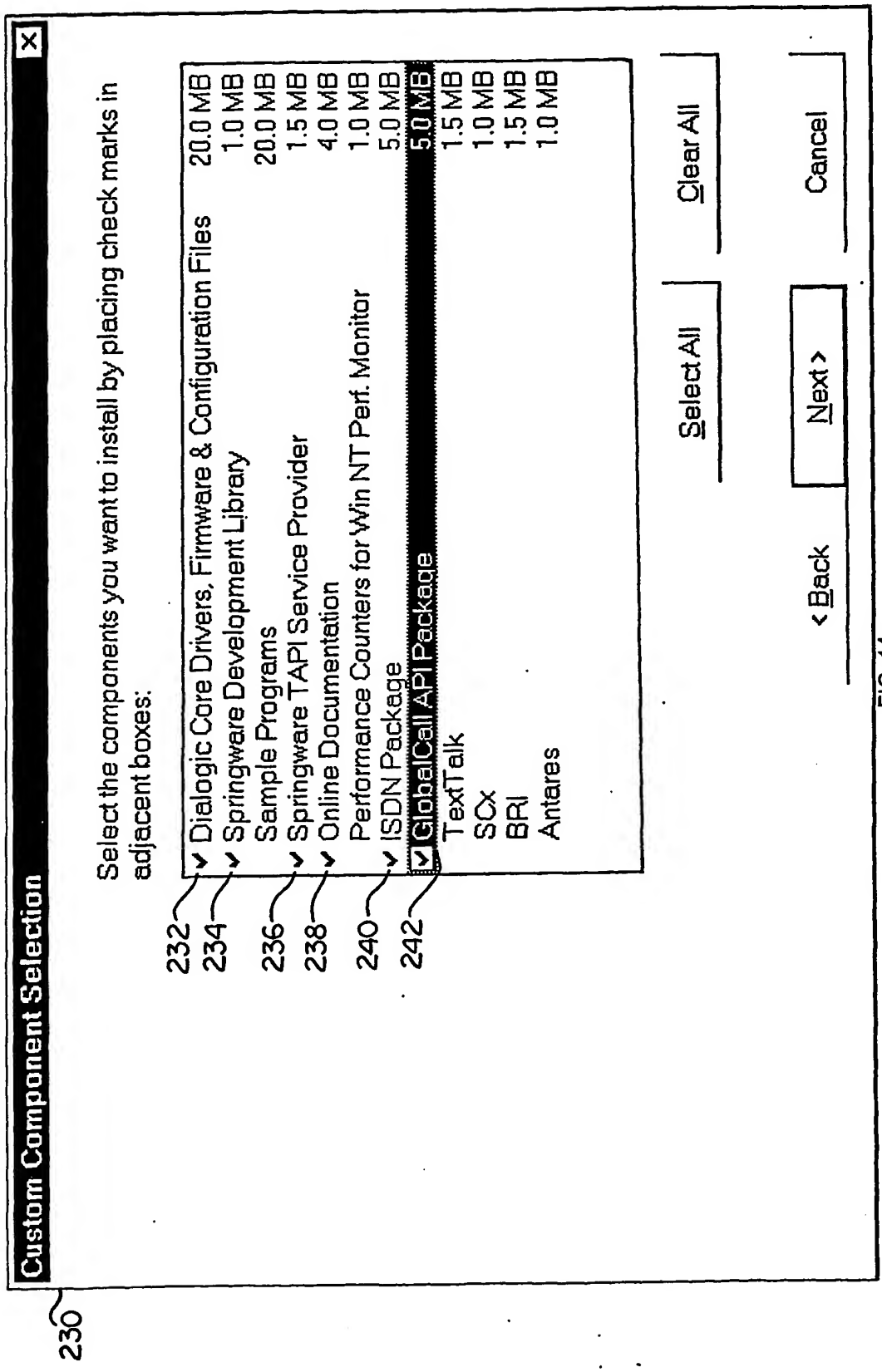

Custom Component Selection
Select the components you want to install by placing check marks in adjacent boxes:
Dialogic Core Drivers, Firmware & Configuration Files 20.0 MB
Springware Development Library 1.0 MB
Sample Programs 20.0 MB
Springware TAPI Service Provider 1.5 MB
Online Documentation 4.0 MB
Performance Counters for Win NT Perf. Monitor 1.0 MB
ISDN Package 5.0 MB
GlobalCall API Package 5.0 MB
TextTalk 1.5 MB
SCx 1.0 MB
BRI 1.5 MB
Antares 1.0 MB
Select All
Clear All
< Back
Next >
Cancel
230
232
234
236
238
240
242

FIG. 14

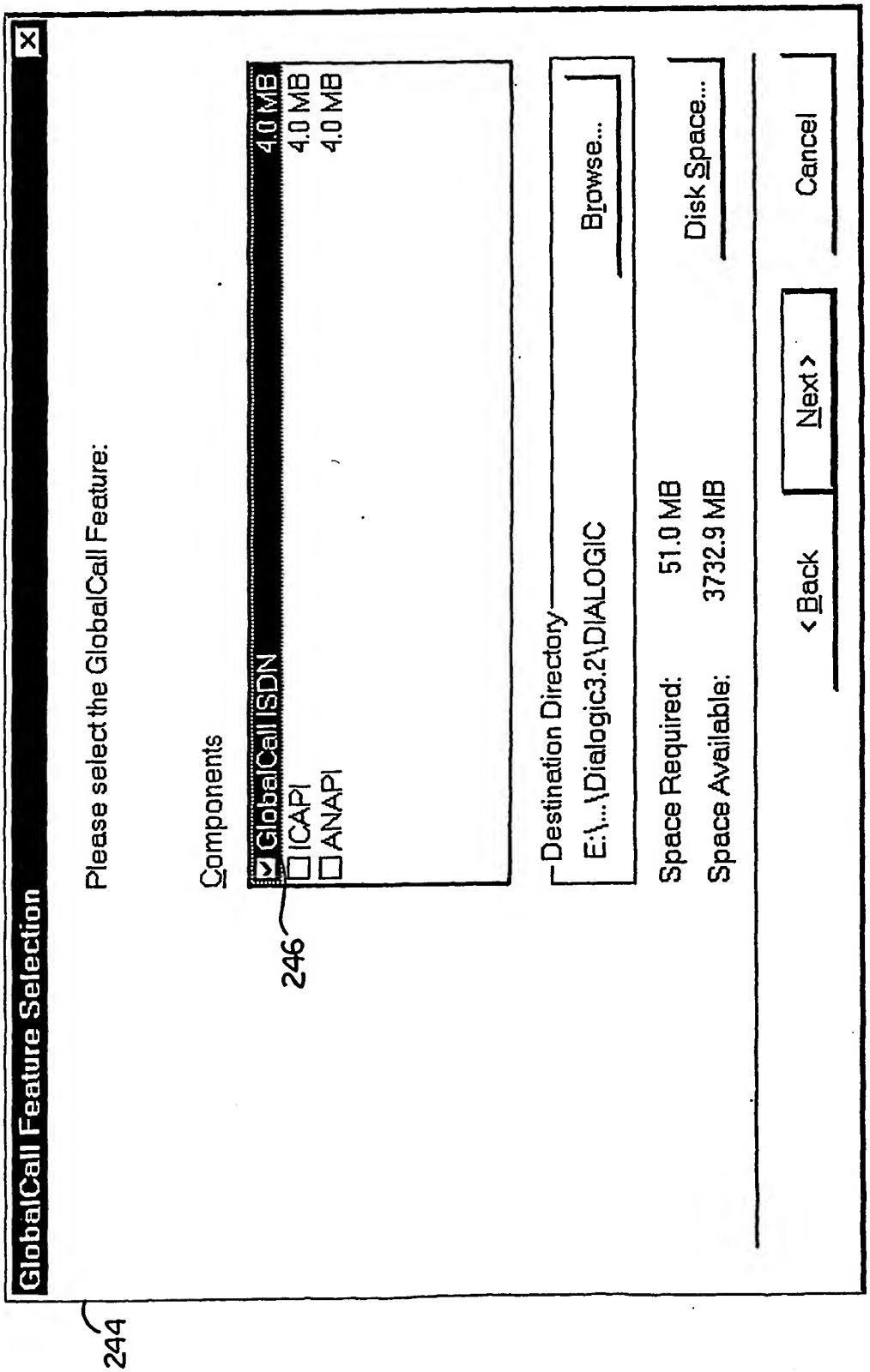
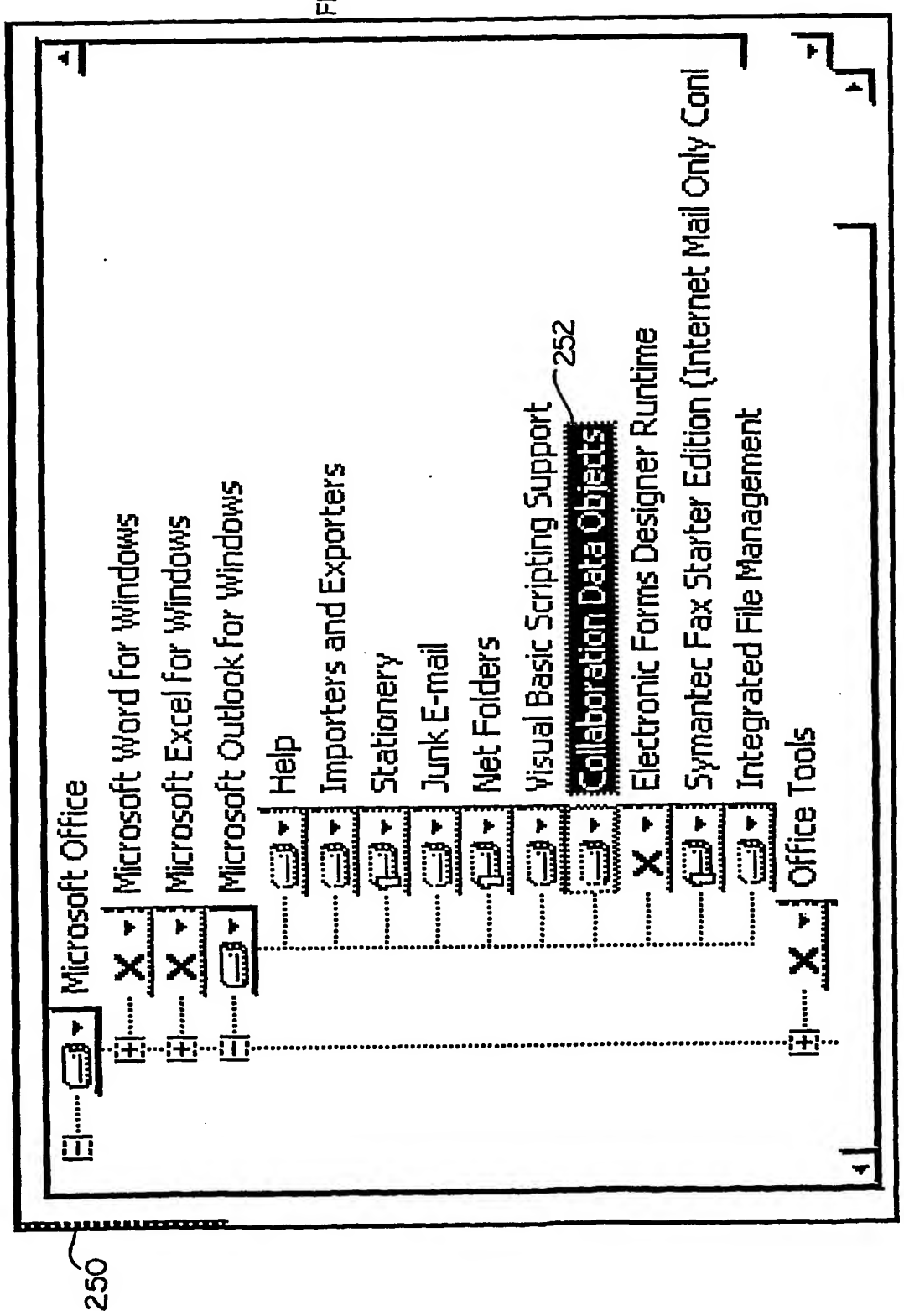

GlobalCall Feature Selection
Please select the GlobalCall Feature:
Components
GlobalCall ISDN 4.0 MB
ICAPI 4.0 MB
ANAPI 4.0 MB
246
Destination Directory
E:\...\Dialogic3.2\DIALOGIC
Browse...
Space Required: 51.0 MB
Space Available: 3732.9 MB
Disk Space...
< Back
Next >
Cancel
244

FIG. 15

FIG. 16


Microsoft Office
Microsoft Word for Windows
Microsoft Excel for Windows
Microsoft Outlook for Windows
Help
Importers and Exporters
Stationery
Junk E-mail
Net Folders
Visual Basic Scripting Support
Collaboration Data Objects
Electronic Forms Designer Runtime
Symantec Fax Starter Edition (Internet Mail Only Conl
Integrated File Management
Office Tools
252
250

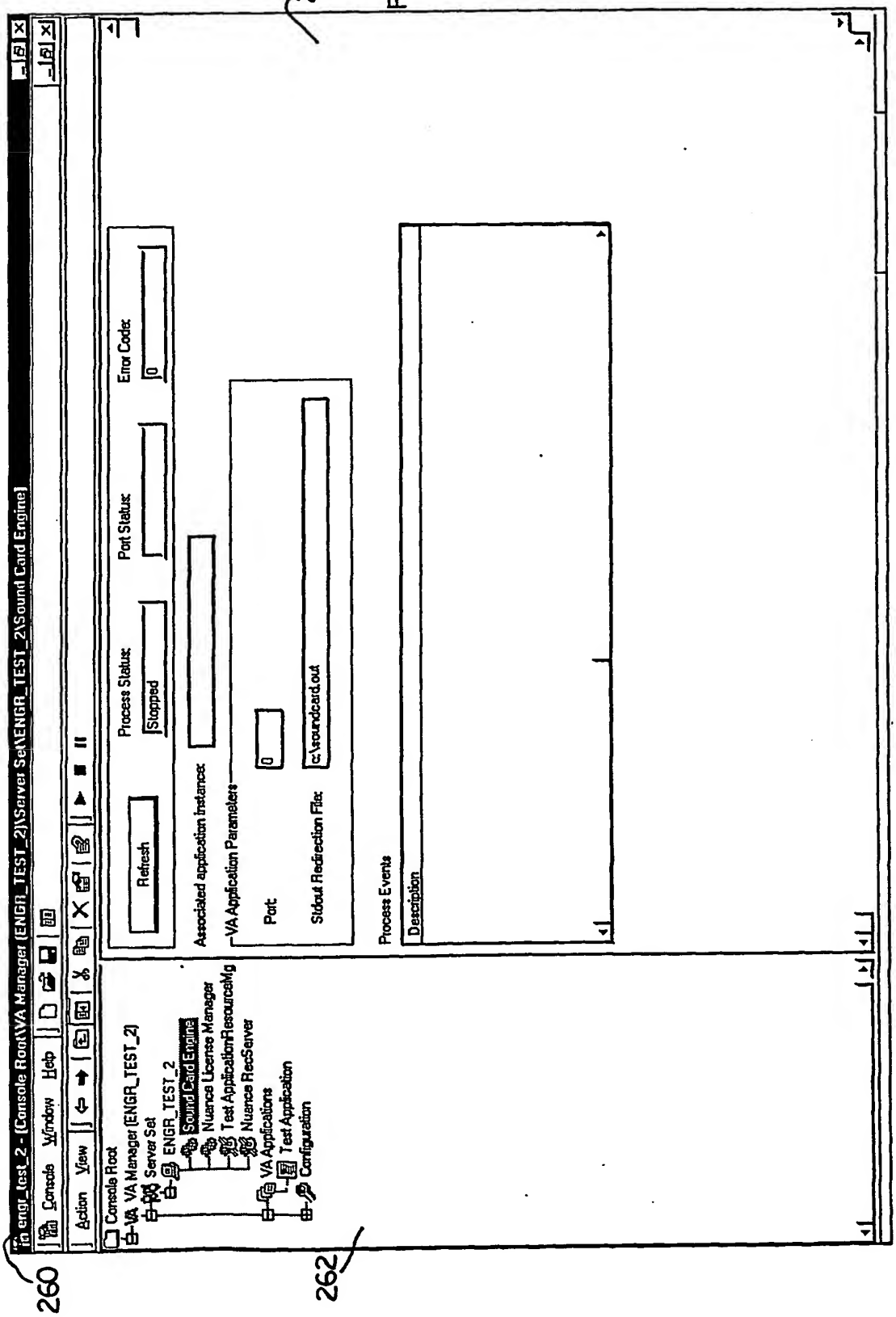

engr_test_2 - [Console Root\VA Manager (ENGR_TEST_2)\Server Set\ENGR_TEST_2\Sound Card Engine]
Console Window Help
Action View
Console Root
VA Manager (ENGR_TEST_2)
Server Set
ENGR_TEST_2
Sound Card Engine
Nuance License Manager
Test ApplicationResourceMg
Nuance RecServer
VA Applications
Test Application
Configuration
Refresh
Process Status:
Stopped
Port Status:
Error Code:
0
Associated application instance:
VA Application Parameters
Port:
0
Stdout Redirection File:
c:\soundcard.out
Process Events
Description
260
262
264

FIG. 17

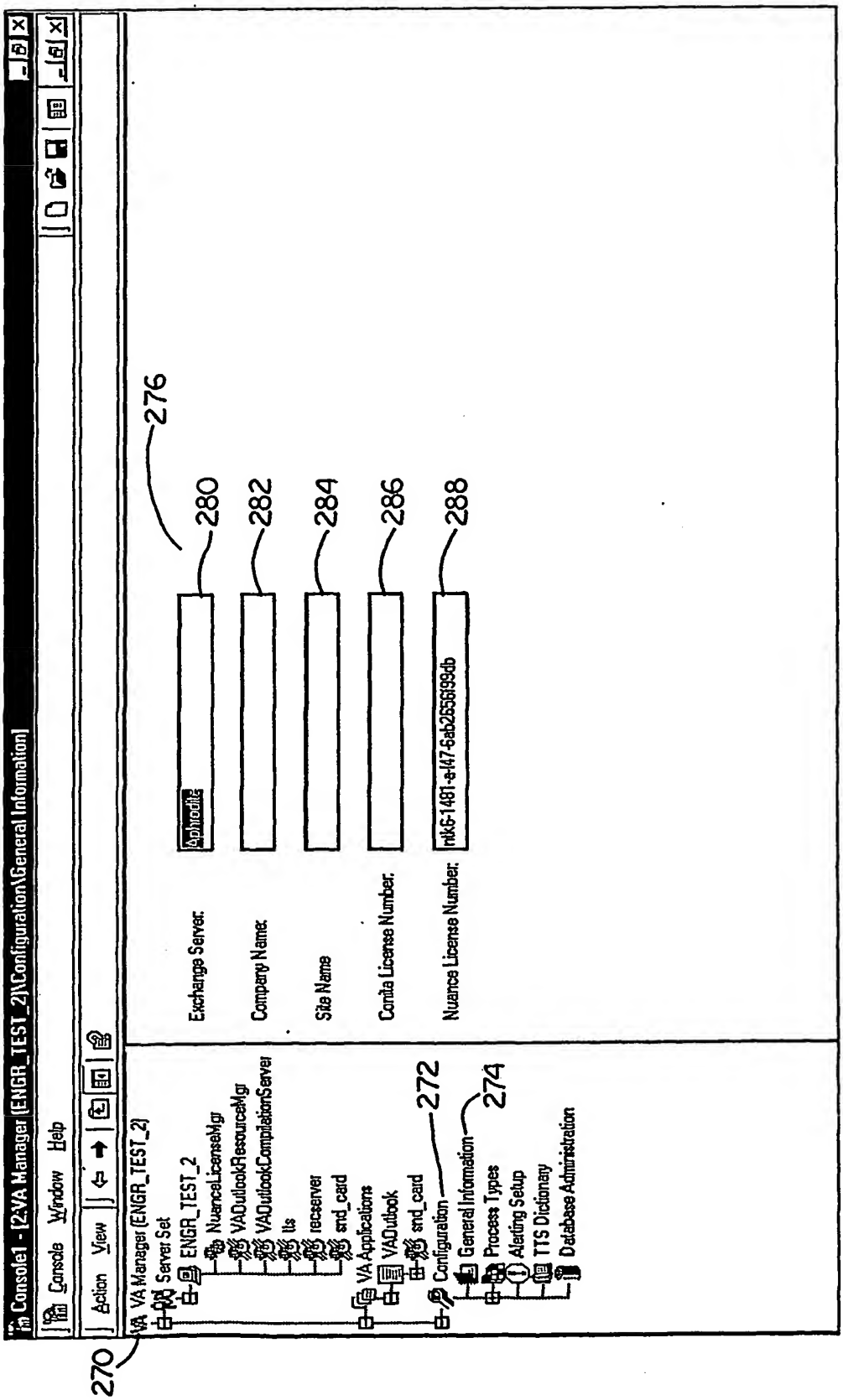

Console1 - [2\VA Manager [ENGR_TEST_2]\Configuration\General Information]
Console Window Help
Action View
VA Manager (ENGR_TEST_2)
Server Set
ENGR_TEST_2
NuanceLicenseMgr
VAOutlookResourceMgr
VAOutlookCompilationServer
tts
receiver
snd_card
VA Applications
VAOutlook
snd_card
Configuration
General Information
Process Types
Alerting Setup
TTS Dictionary
Database Administration
Exchange Server:
Company Name:
Site Name
Contia License Number:
Nuance License Number:
mlk6-1491-a147-6ab2656999db
270
272
274
276
280
282
284
286
288

FIG. 18

FIG. 19

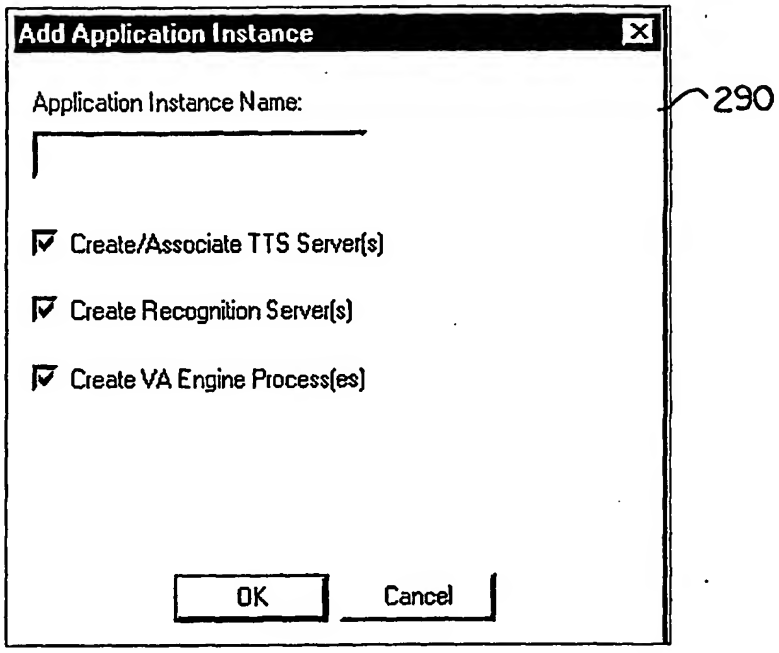

Add Application Instance
Application Instance Name:
290
Create/Associate TTS Server(s)
Create Recognition Server(s)
Create VA Engine Process(es)
OK
Cancel

FIG. 20

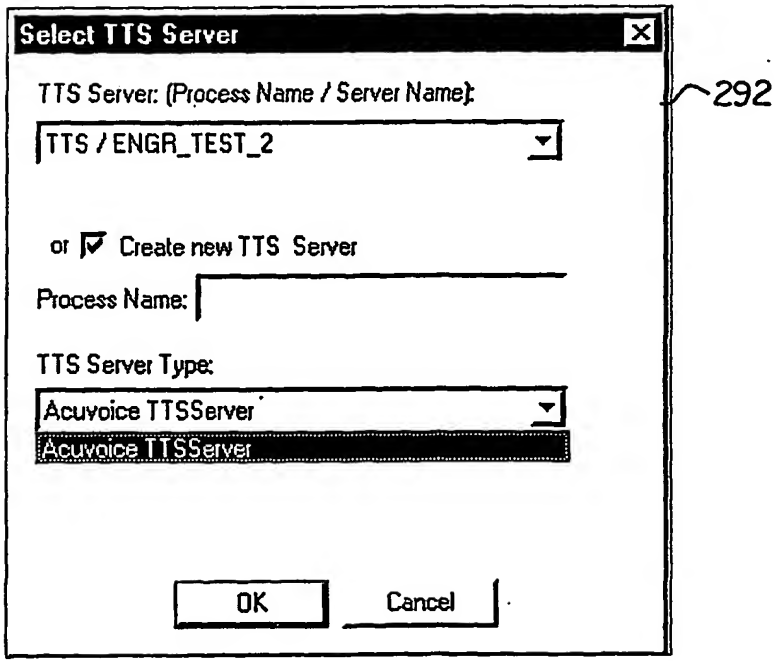

Select TTS Server
TTS Server: (Process Name / Server Name):
292
TTS / ENGR_TEST_2
or Create new TTS Server
Process Name:
TTS Server Type:
Acuvoice TTSServer
Acuvoice TTSServer
OK
Cancel

FIG. 21

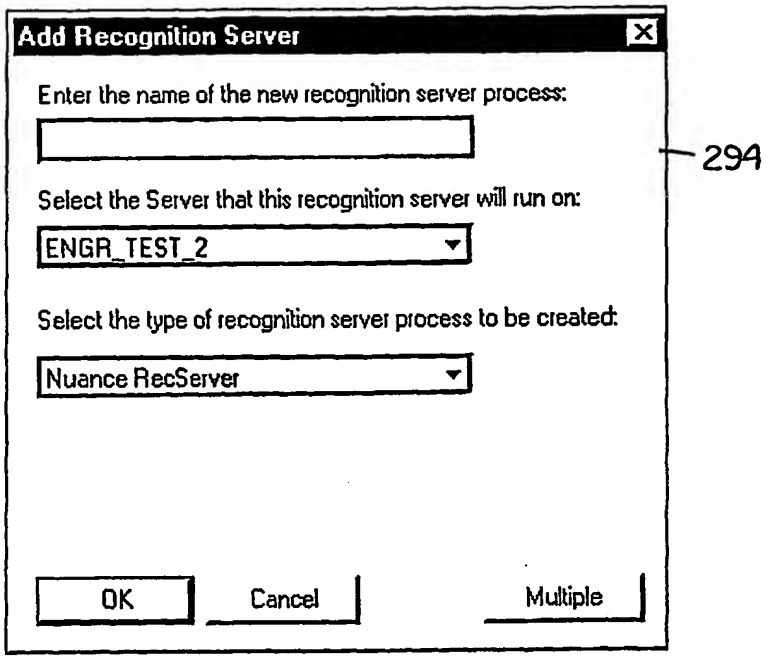

Add Recognition Server
Enter the name of the new recognition server process:
Select the Server that this recognition server will run on:
ENGR_TEST_2
Select the type of recognition server process to be created:
Nuance RecServer
OK
Cancel
Multiple
294

FIG. 22

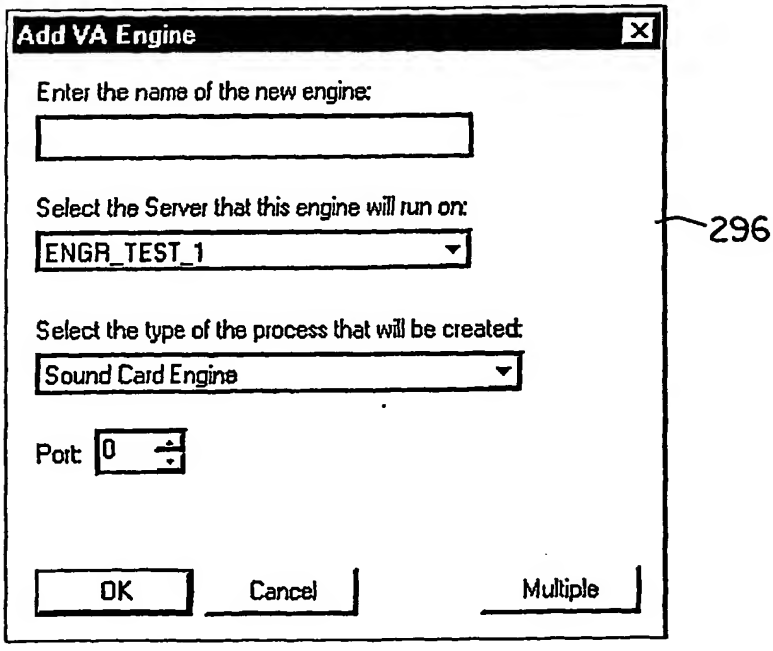

Add VA Engine
Enter the name of the new engine:
Select the Server that this engine will run on:
ENGR_TEST_1
Select the type of the process that will be created:
Sound Card Engine
Port:
0
OK
Cancel
Multiple
296

FIG. 23

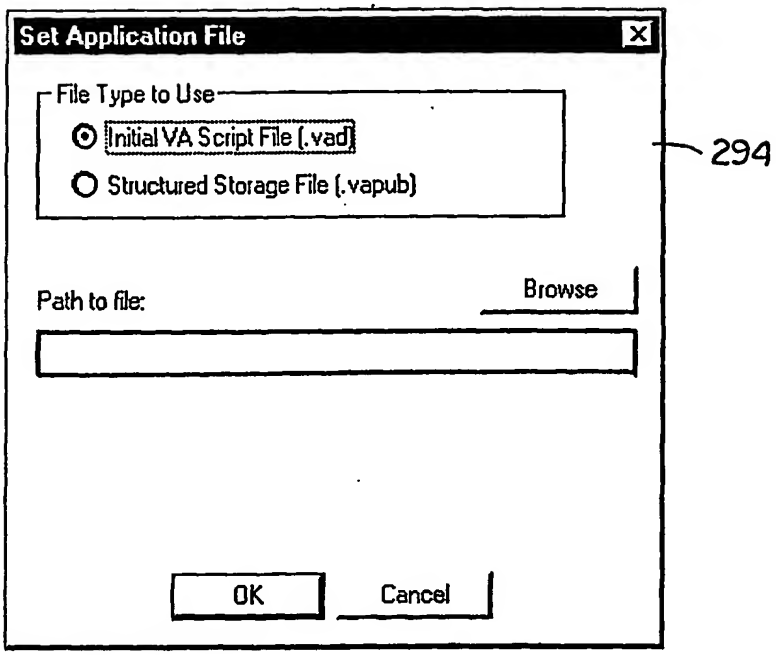
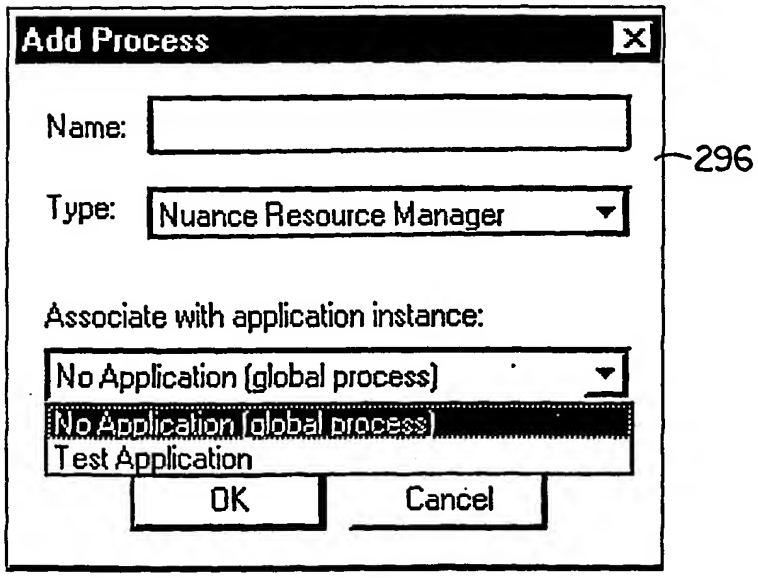

Set Application File
File Type to Use
Initial VA Script File (.vad)
Structured Storage File (.vapub)
294
Path to file:
Browse
OK
Cancel

FIG. 24


Add Process
Name:
296
Type:
Nuance Resource Manager
Associate with application instance:
No Application (global process)
No Application (global process)
Test Application
OK
Cancel

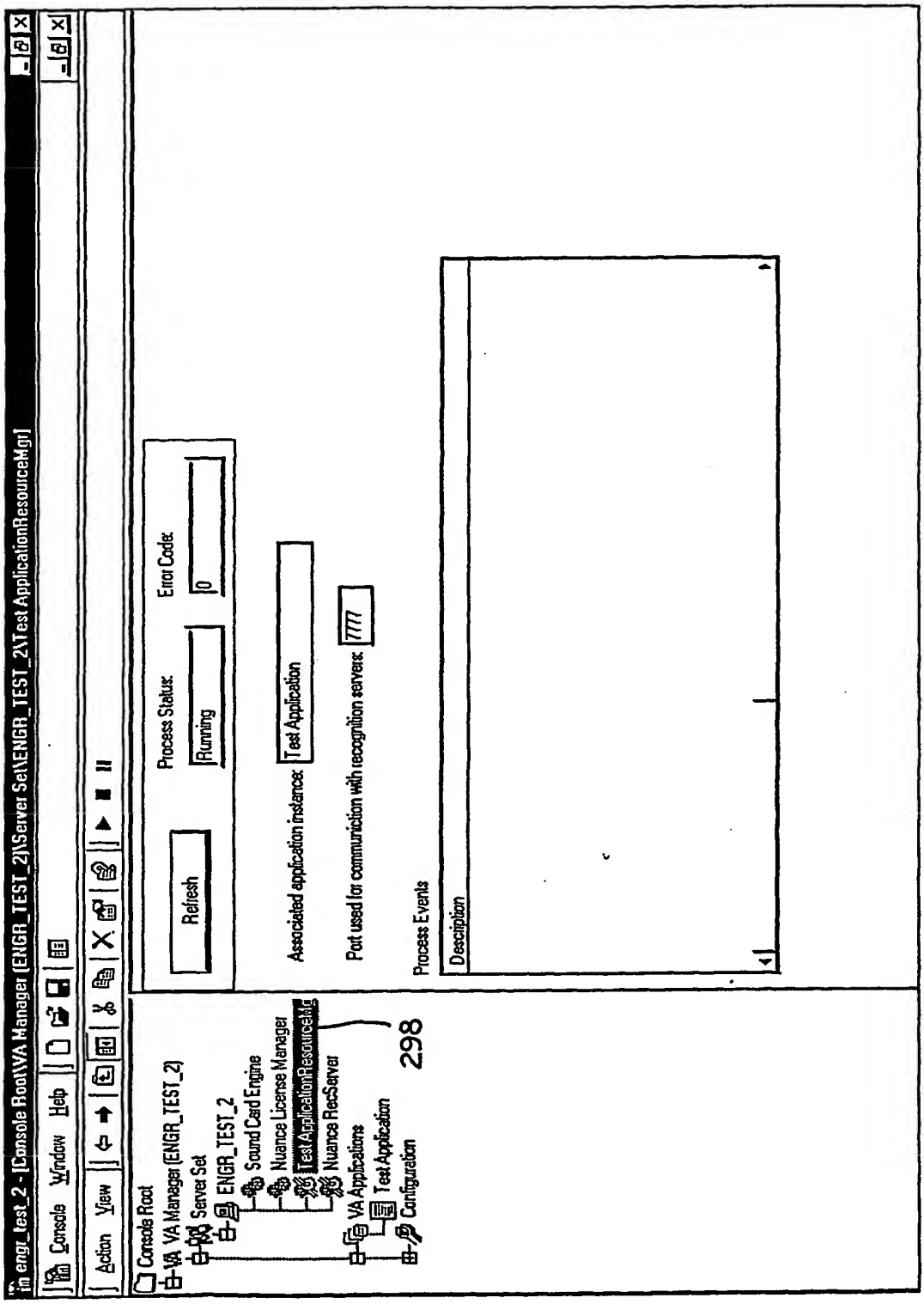

in engr_test_2 - [Console Root\VA Manager (ENGR_TEST_2)\Server Set\ENGR_TEST_2\Test ApplicationResourceMgr]
Console Window Help
Action View
Console Root
VA VA Manager (ENGR_TEST_2)
Server Set
ENGR_TEST_2
Sound Card Engine
Nuance License Manager
Test ApplicationResourceMgr
Nuance RecServer
VA Applications
Test Application
Configuration
298
Refresh
Process Status:
Running
Error Code:
0
Associated application instance:
Test Application
Port used for communication with recognition server:
7777
Process Events
Description

FIG. 25

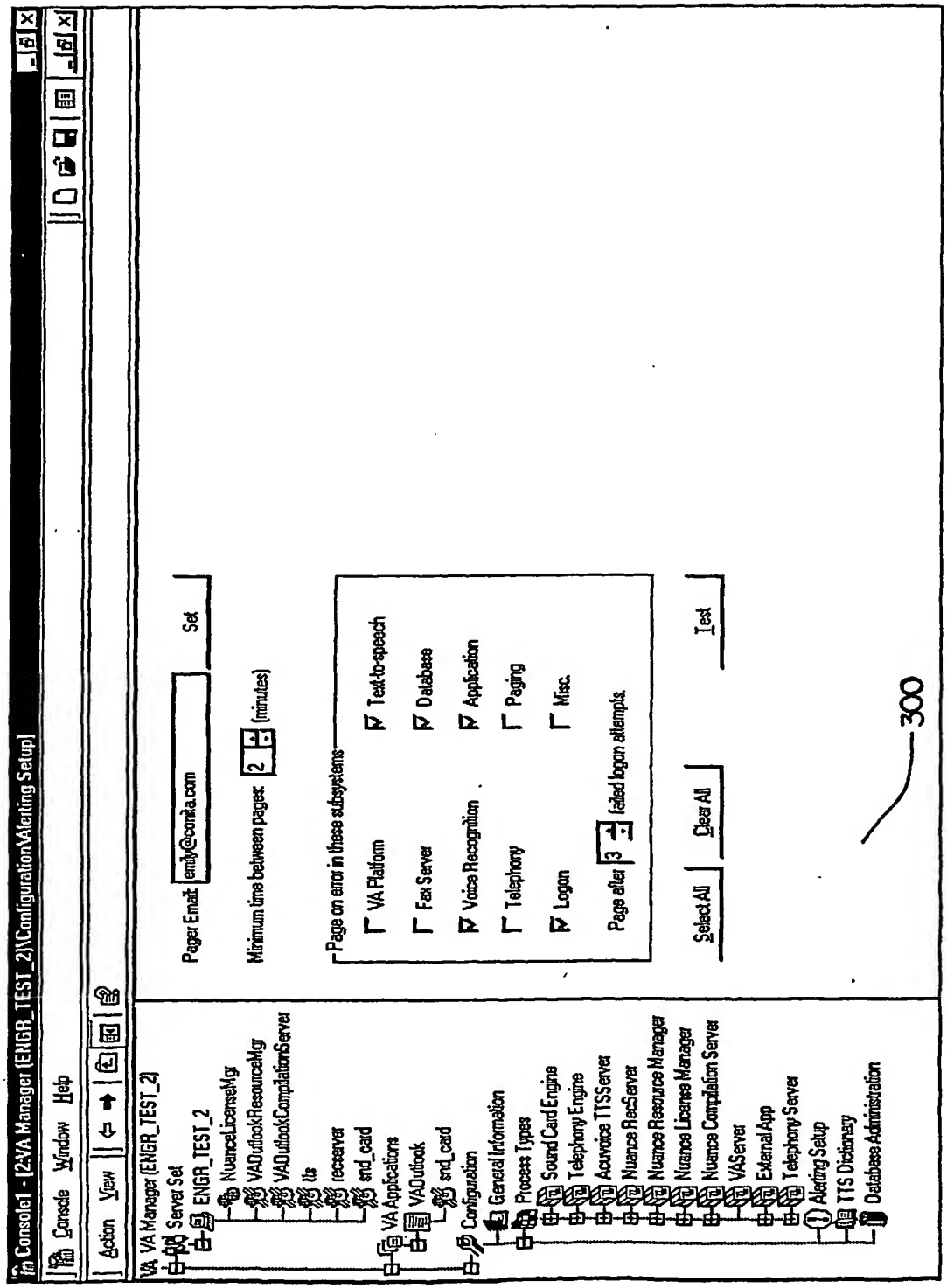

Console1 - [2\VA Manager (ENGR_TEST_2)\Configuration\Alerting Setup]
Console Window Help
Action View
VA Manager (ENGR_TEST_2)
Server Set
ENGR_TEST_2
NuanceLicenseMgr
VADutlookResourceMgr
VADutlookCompilationServer
tts
recserver
snd_card
VA Applications
VADutlook
snd_card
Configuration
General Information
Process Types
Sound Card Engine
Telephony Engine
Acuvoice TTSServer
Nuance RecServer
Nuance Resource Manager
Nuance License Manager
Nuance Compilation Server
VAServer
External App
Telephony Server
Alerting Setup
TTS Dictionary
Database Administration
Pager Email emily@conita.com
Set
Minimum time between pages: 2 [minutes]
Page on error in these subsystems
VA Platform
Text-to-speech
Fax Server
Database
Voice Recognition
Application
Telephony
Paging
Logon
Misc.
Page after 3 failed logon attempts.
Select All
Clear All
Test
300

FIG. 26

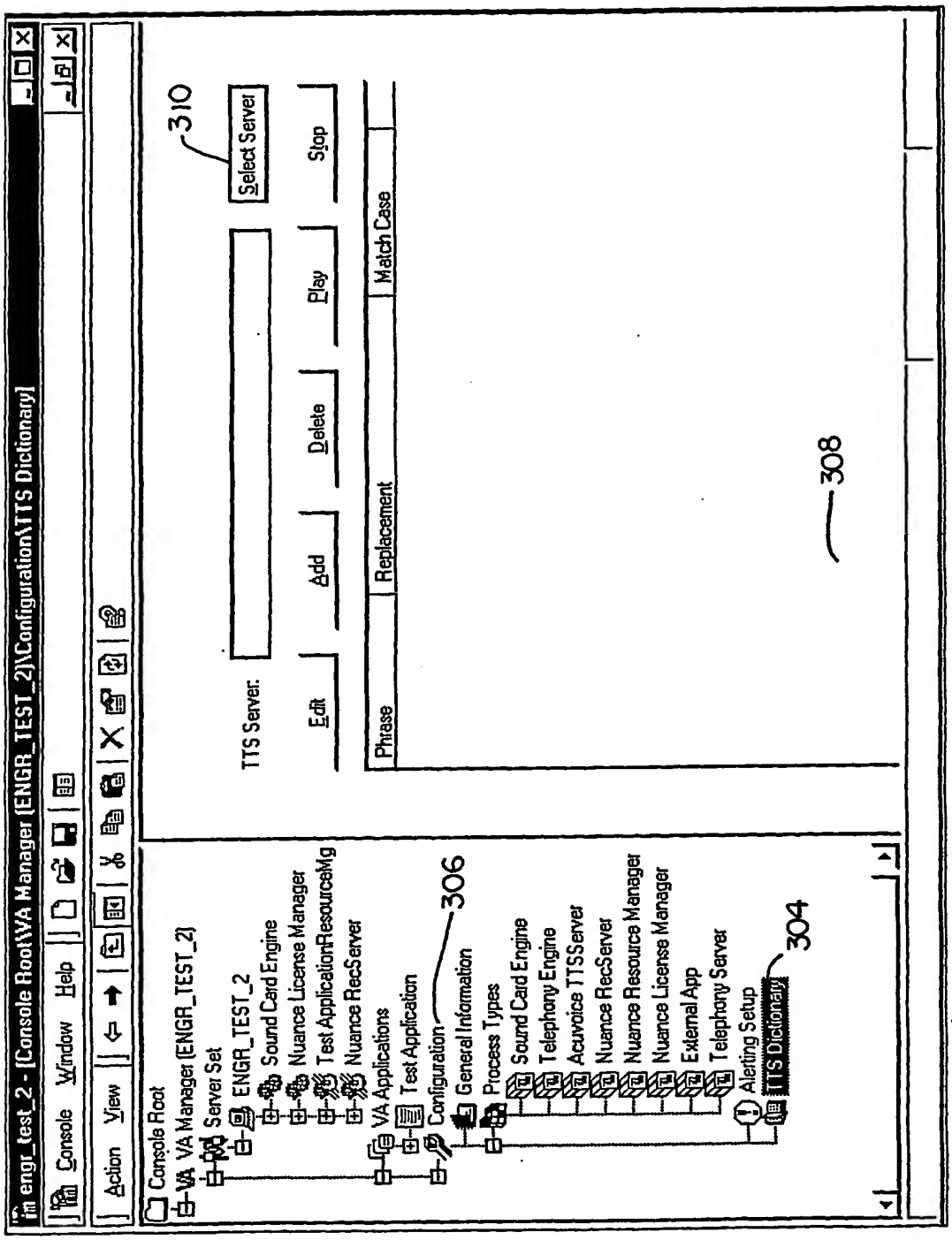

engr_test_2 - [Console Root\VA Manager (ENGR_TEST_2)\Configuration\TTS Dictionary]
Console Window Help
Action View
Console Root
VA Manager (ENGR_TEST_2)
Server Set
ENGR_TEST_2
Sound Card Engine
Nuance License Manager
Test ApplicationResourceMg
Nuance RecServer
VA Applications
Test Application
Configuration
General Information
Process Types
Sound Card Engine
Telephony Engine
Acuvoice TTSServer
Nuance RecServer
Nuance Resource Manager
Nuance License Manager
External App
Telephony Server
Alerting Setup
TTS Dictionary
306
304
308
310
TTS Server:
Edit
Add
Delete
Play
Stop
Select Server
Phrase
Replacement
Match Case

FIG. 27

FIG. 28

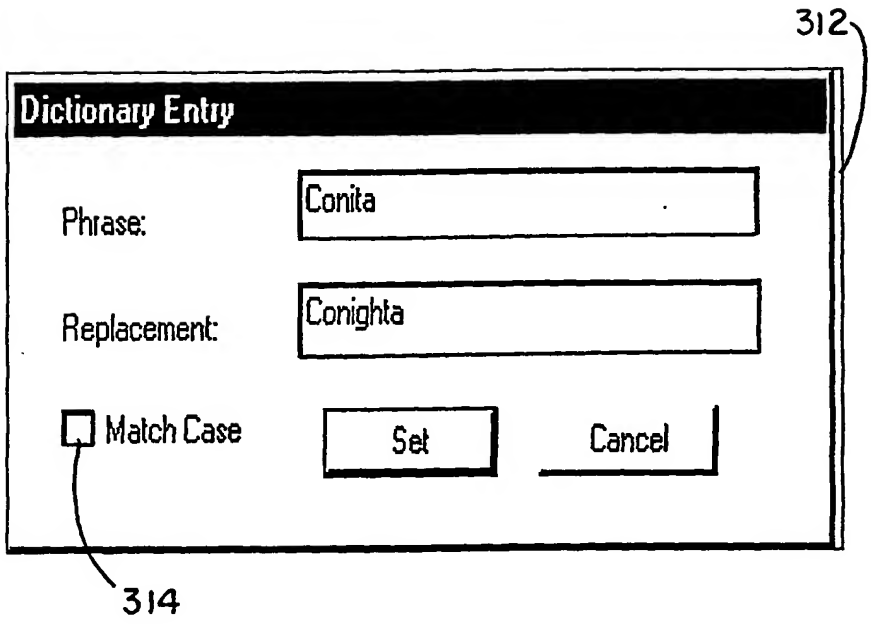

312
Dictionary Entry
Phrase:
Conita
Replacement:
Conighta
Match Case
Set
Cancel
314

FIG. 29

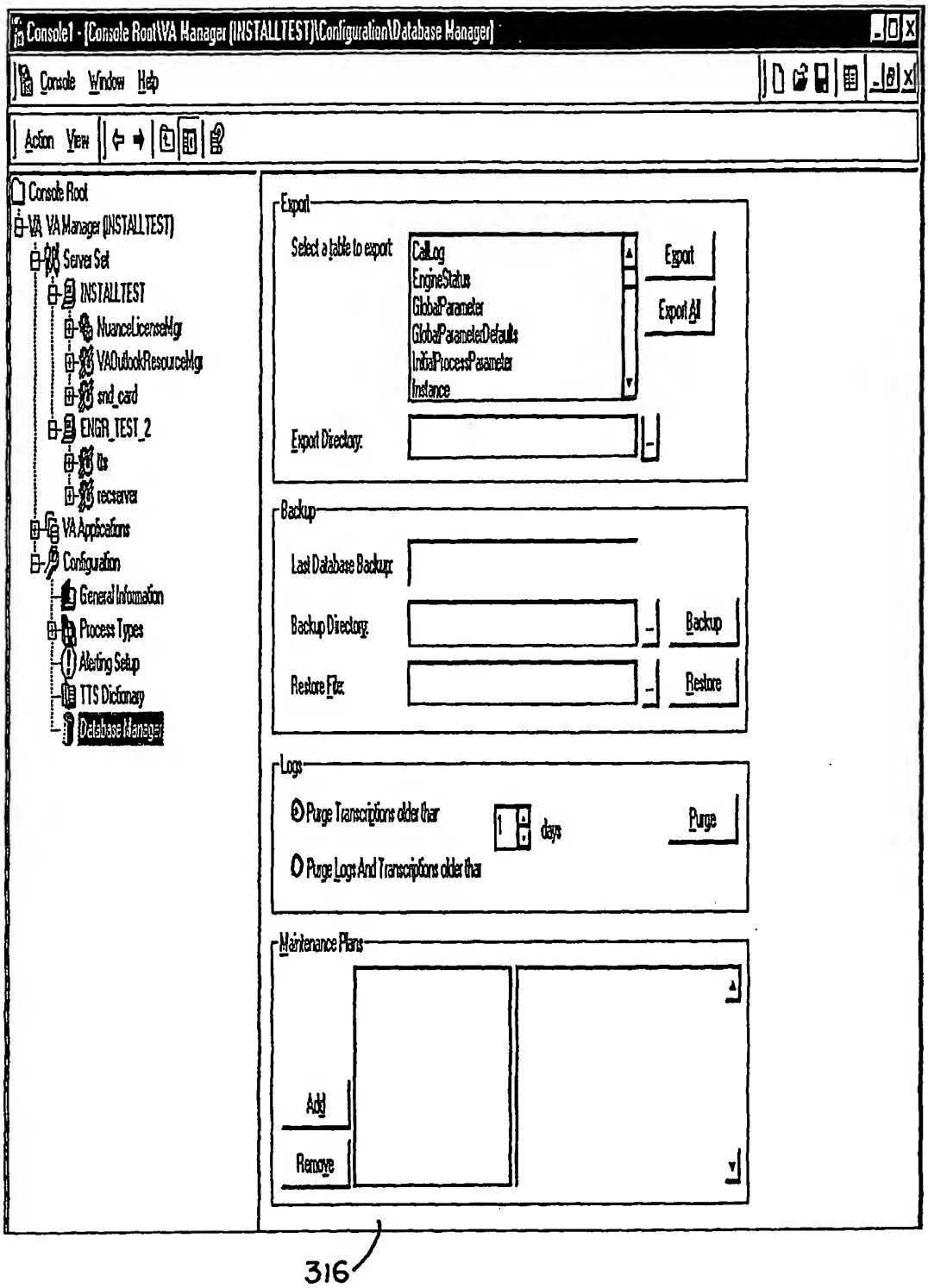

Console1 - [Console Root\VA Manager (INSTALLTEST)\Configuration\Database Manager]
Console Window Help
Action View
Console Root
VA Manager (INSTALLTEST)
Server Set
INSTALLTEST
NuanceLicenseMgr
VAOutlookResourceMgr
snd_card
ENGR_TEST_2
tts
recserver
VA Applications
Configuration
General Information
Process Types
Alerting Setup
TTS Dictionary
Database Manager
Export
Select a table to export:
CallLog
EngineStatus
GlobalParameter
GlobalParameterDefaults
InitialProcessParameter
Instance
Export
Export All
Export Directory:
Backup
Last Database Backup:
Backup Directory:
Backup
Restore File:
Restore
Logs
Purge Transcriptions older than
1
days
Purge
Purge Logs And Transcriptions older than
Maintenance Plans
Add
Remove
316

FIG. 30

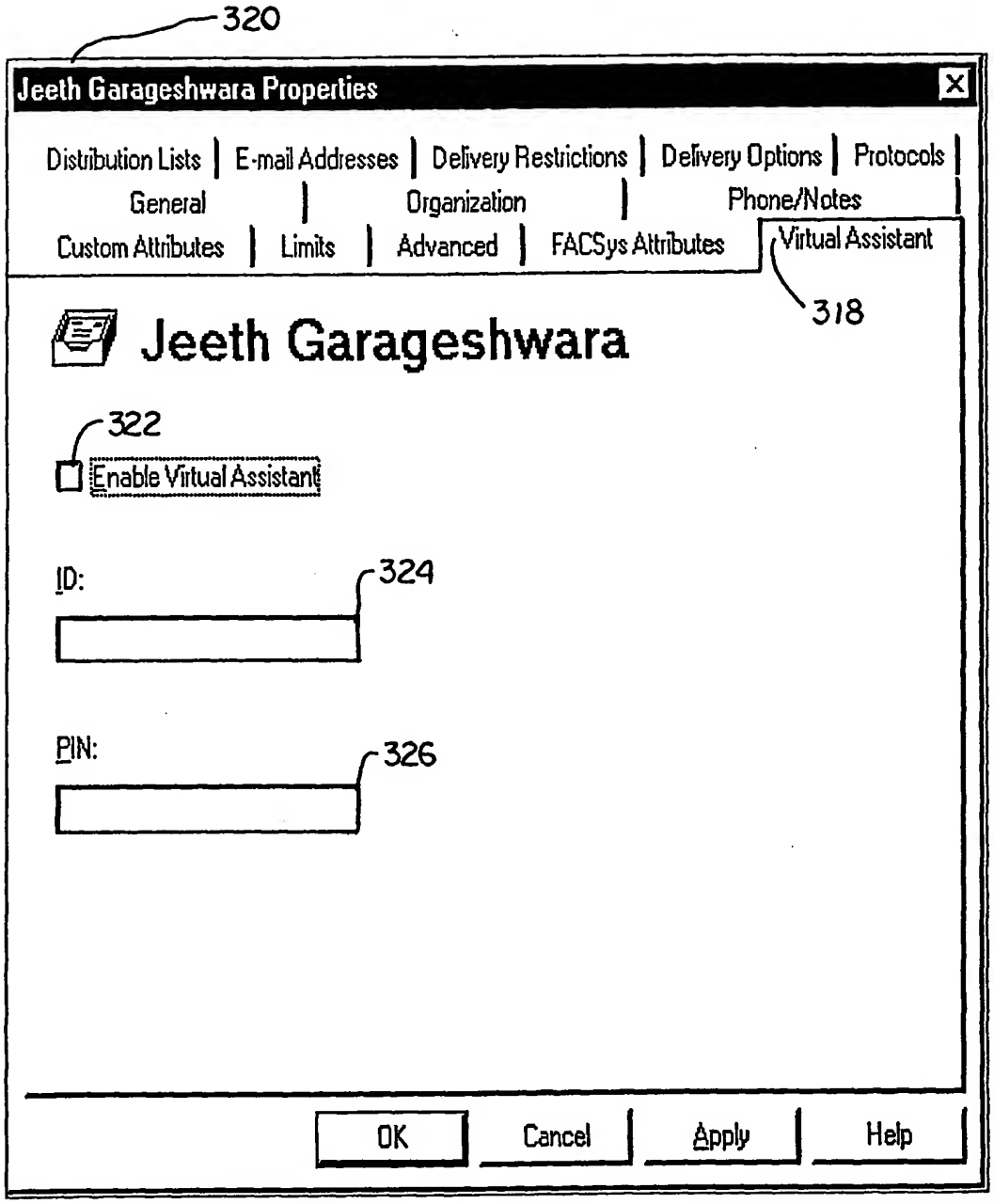

320
Jeeth Garageshwara Properties
Distribution Lists
E-mail Addresses
Delivery Restrictions
Delivery Options
Protocols
General
Organization
Phone/Notes
Custom Attributes
Limits
Advanced
FACSys Attributes
Virtual Assistant
318
Jeeth Garageshwara
322
Enable Virtual Assistant
ID:
324
PIN:
326
OK
Cancel
Apply
Help

FIG. 31

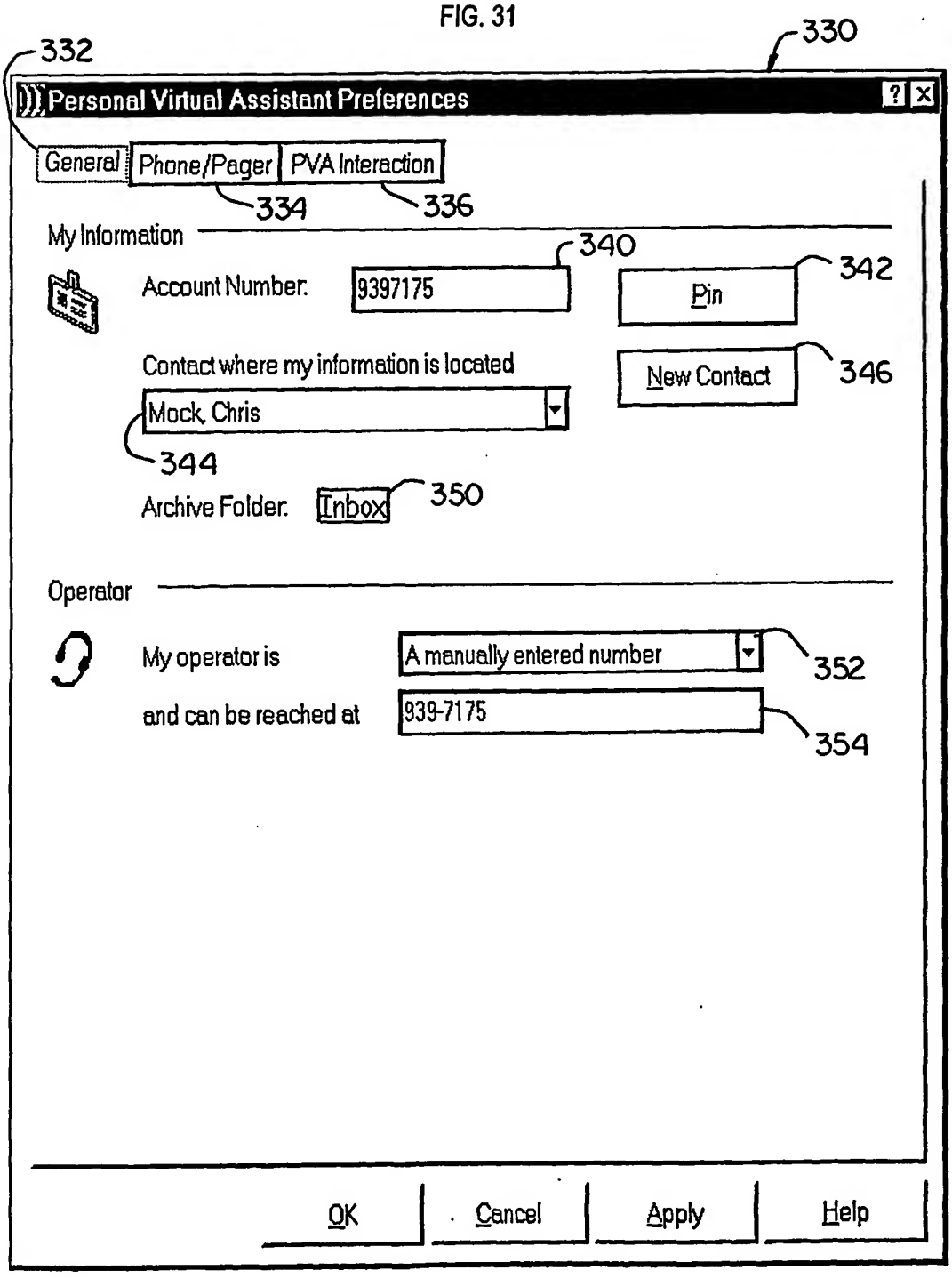

332
330
Personal Virtual Assistant Preferences
General
Phone/Pager
PVA Interaction
334
336
My Information
340
Account Number:
9397175
Pin
342
Contact where my information is located
New Contact
346
Mock, Chris
344
Archive Folder:
Inbox
350
Operator
My operator is
A manually entered number
352
and can be reached at
939-7175
354
OK
Cancel
Apply
Help

FIG. 32

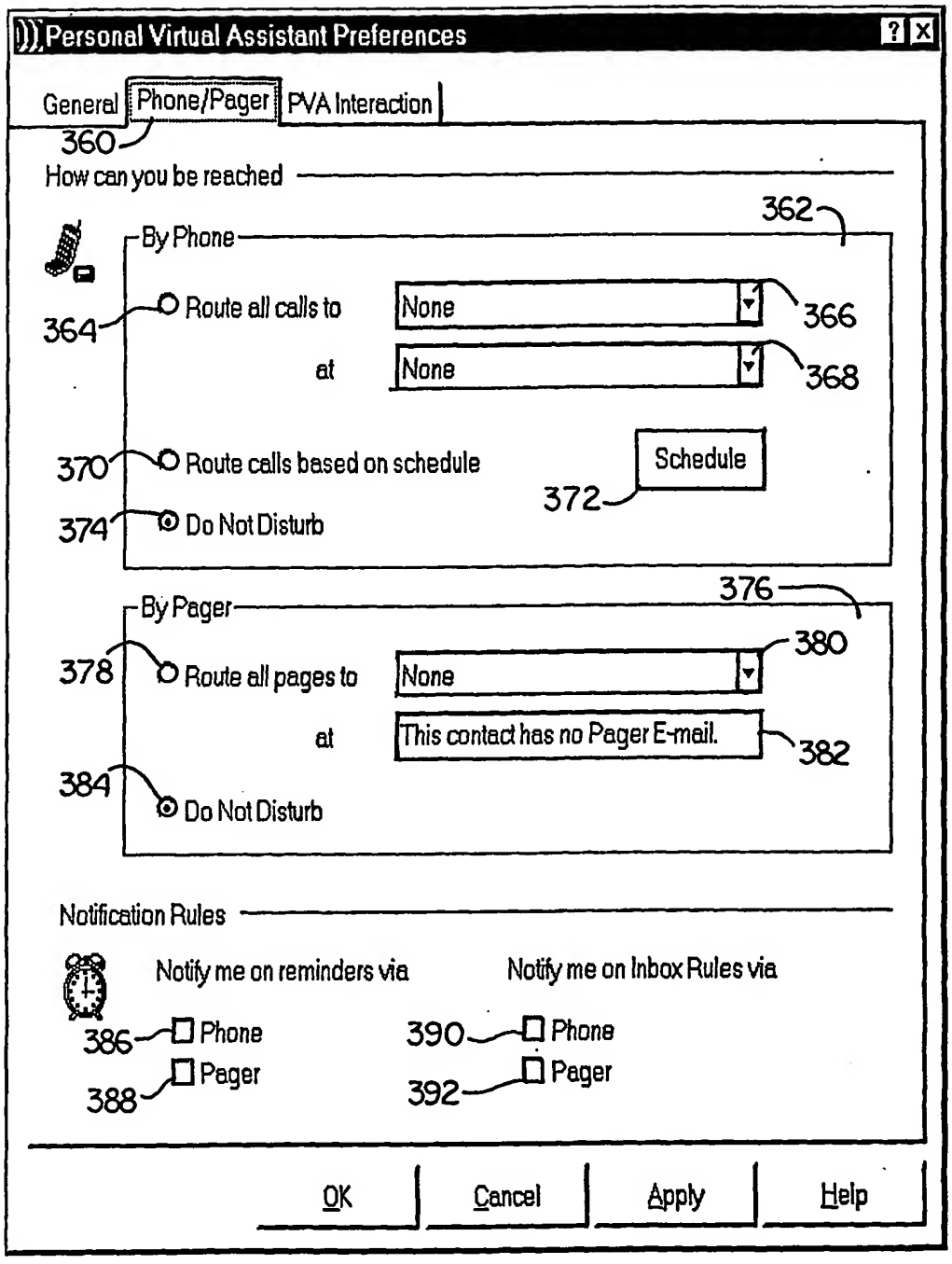
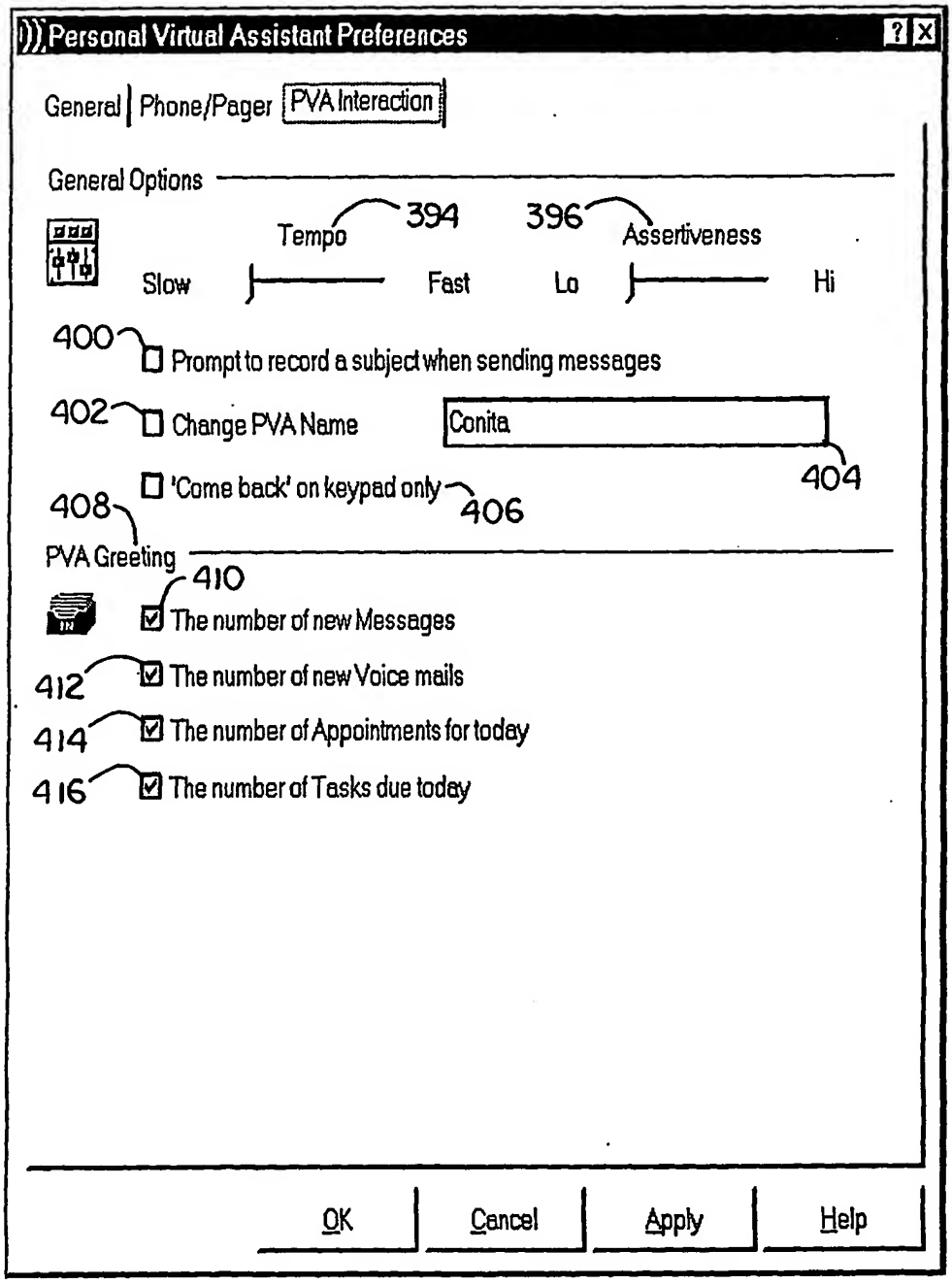
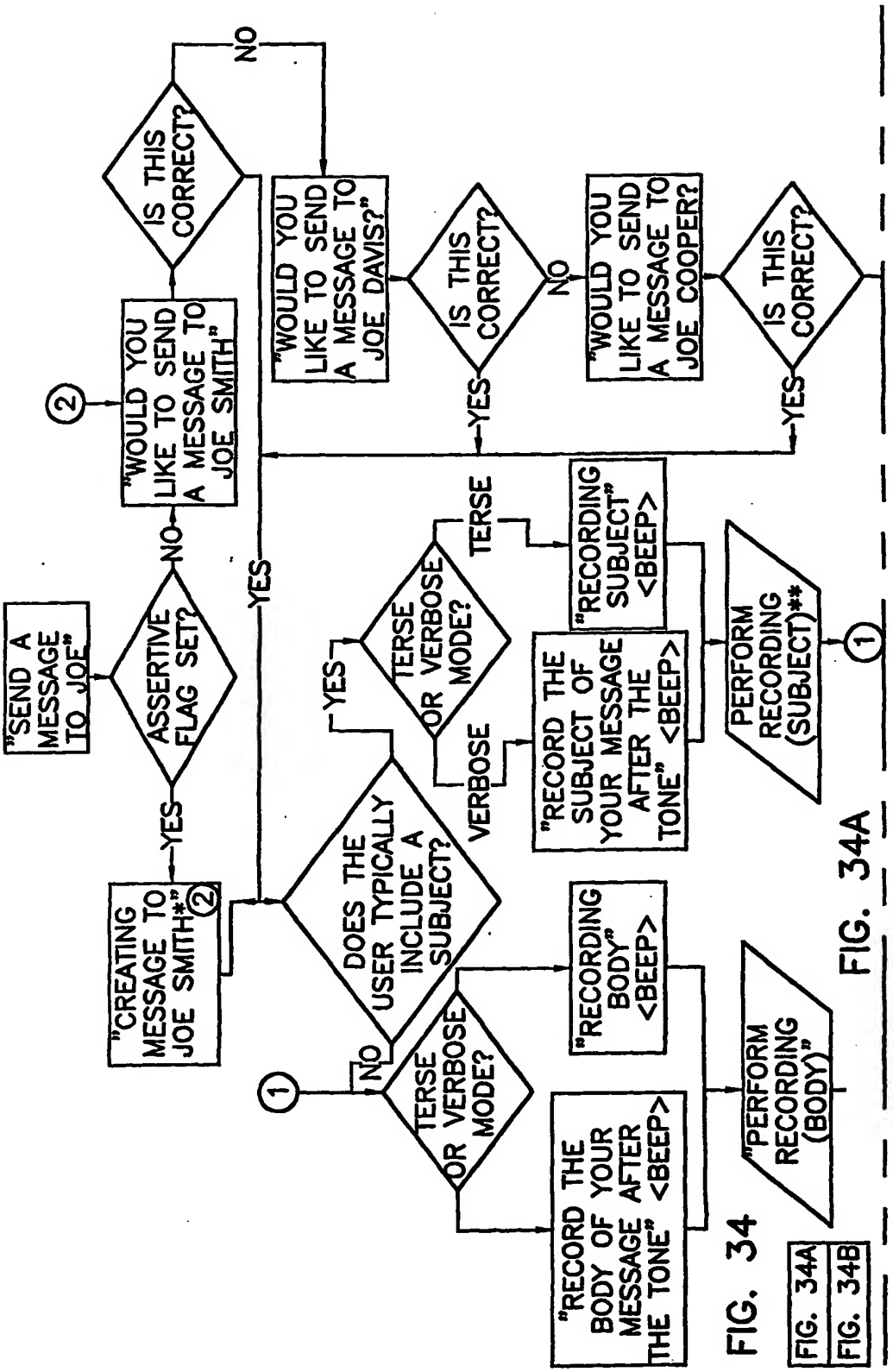

Personal Virtual Assistant Preferences
General
Phone/Pager
PVA Interaction
360
How can you be reached
362
By Phone
364
Route all calls to
None
366
at
None
368
370
Route calls based on schedule
Schedule
372
374
Do Not Disturb
376
By Pager
378
Route all pages to
None
380
at
This contact has no Pager E-mail.
382
384
Do Not Disturb
Notification Rules
Notify me on reminders via
Notify me on Inbox Rules via
386
Phone
388
Pager
390
Phone
392
Pager
OK
Cancel
Apply
Help

FIG. 33


Personal Virtual Assistant Preferences
General
Phone/Pager
PVA Interaction
General Options
Tempo
394
396
Assertiveness
Slow
Fast
Lo
Hi
400
Prompt to record a subject when sending messages
402
Change PVA Name
Conita
404
'Come back' on keypad only
406
408
PVA Greeting
410
The number of new Messages
412
The number of new Voice mails
414
The number of Appointments for today
416
The number of Tasks due today
OK
Cancel
Apply
Help


"SEND A MESSAGE TO JOE"
ASSERTIVE FLAG SET?
YES
NO
"CREATING MESSAGE TO JOE SMITH*"
2
"WOULD YOU LIKE TO SEND A MESSAGE TO JOE SMITH"
2
IS THIS CORRECT?
NO
YES
"WOULD YOU LIKE TO SEND A MESSAGE TO JOE DAVIS?"
IS THIS CORRECT?
NO
YES
"WOULD YOU LIKE TO SEND A MESSAGE TO JOE COOPER?
IS THIS CORRECT?
YES
1
DOES THE USER TYPICALLY INCLUDE A SUBJECT?
YES
TERSE OR VERBOSE MODE?
TERSE
"RECORDING SUBJECT" <BEEP>
VERBOSE
"RECORD THE SUBJECT OF YOUR MESSAGE AFTER THE TONE" <BEEP>
PERFORM RECORDING (SUBJECT)**
1
NO
TERSE OR VERBOSE MODE?
"RECORDING BODY" <BEEP>
"RECORD THE BODY OF YOUR MESSAGE AFTER THE TONE" <BEEP>
"PERFORM RECORDING (BODY)"
FIG. 34A
FIG. 34
FIG. 34A
FIG. 34B

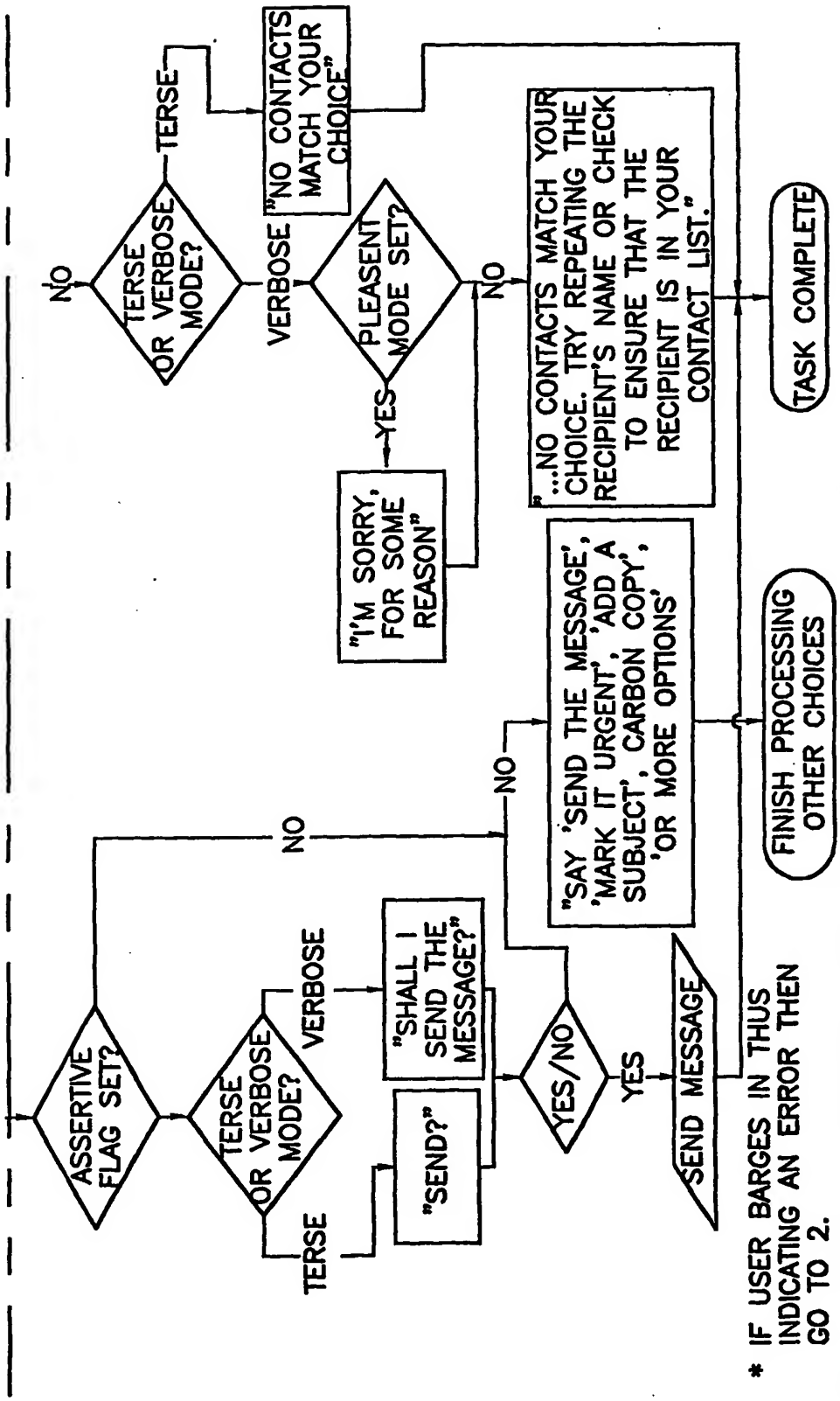
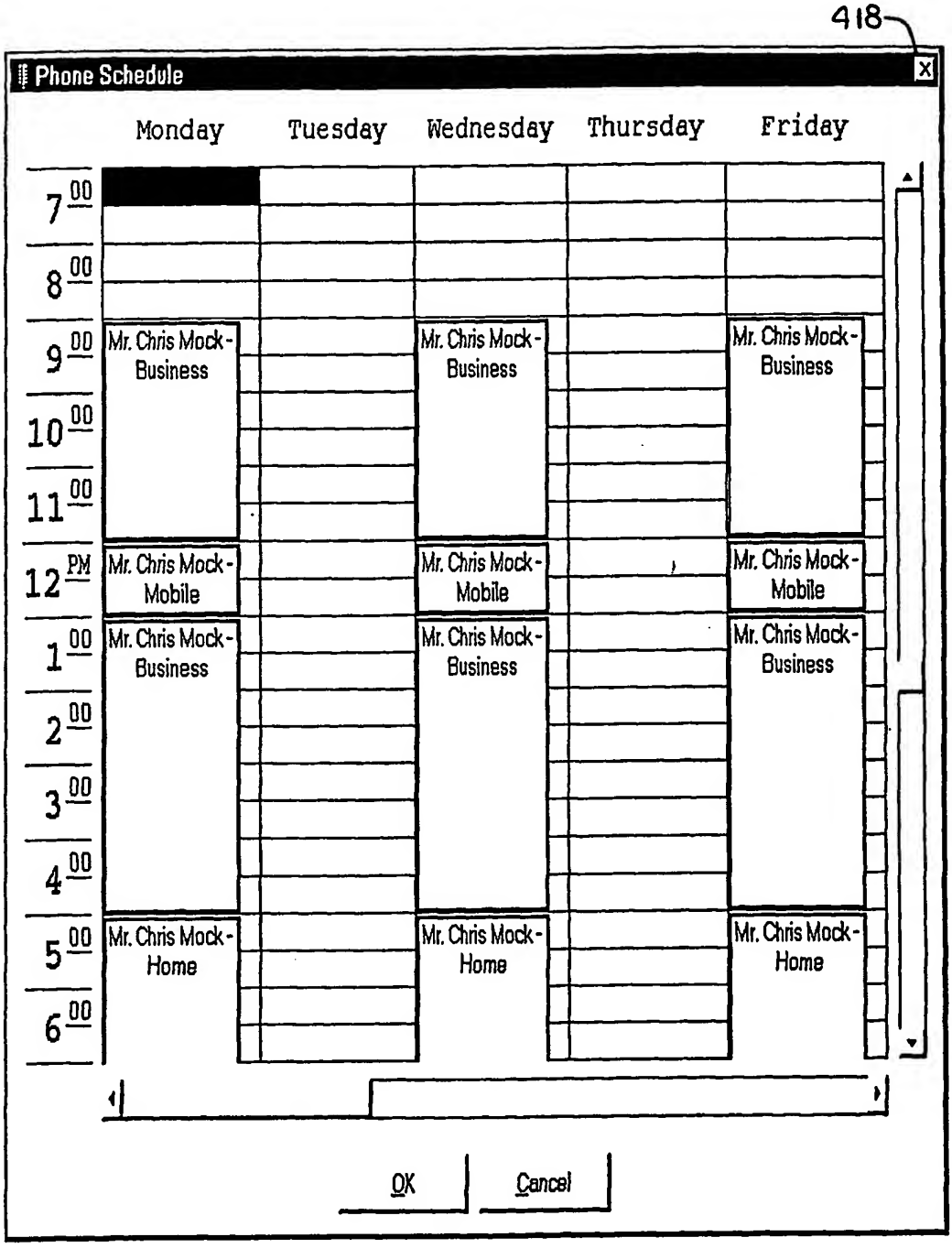

ASSERTIVE FLAG SET?
NO
TERSE OR VERBOSE MODE?
TERSE
VERBOSE
"SEND?"
"SHALL I SEND THE MESSAGE?"
YES/NO
NO
YES
"SAY 'SEND THE MESSAGE', 'MARK IT URGENT', 'ADD A SUBJECT', CARBON COPY', 'OR MORE OPTIONS'
SEND MESSAGE
FINISH PROCESSING OTHER CHOICES
TERSE OR VERBOSE MODE?
NO
TERSE
VERBOSE
"NO CONTACTS MATCH YOUR CHOICE"
PLEASENT MODE SET?
NO
YES
"I'M SORRY, FOR SOME REASON"
"...NO CONTACTS MATCH YOUR CHOICE. TRY REPEATING THE RECIPIENT'S NAME OR CHECK TO ENSURE THAT THE RECIPIENT IS IN YOUR CONTACT LIST."
TASK COMPLETE
* IF USER BARGES IN THUS INDICATING AN ERROR THEN GO TO 2.
** IF EXPERT OR IMPATIENT USER THEN SET ENPOINT DETECTOR TIME=3 SECONDS ELSE=6 SECONDS.

FIG. 34B

FIG. 35


418
Phone Schedule
Monday
Tuesday
Wednesday
Thursday
Friday
7 00
8 00
9 00
10 00
11 00
12 PM
1 00
2 00
3 00
4 00
5 00
6 00
Mr. Chris Mock - Business
Mr. Chris Mock - Mobile
Mr. Chris Mock - Home
OK
Cancel

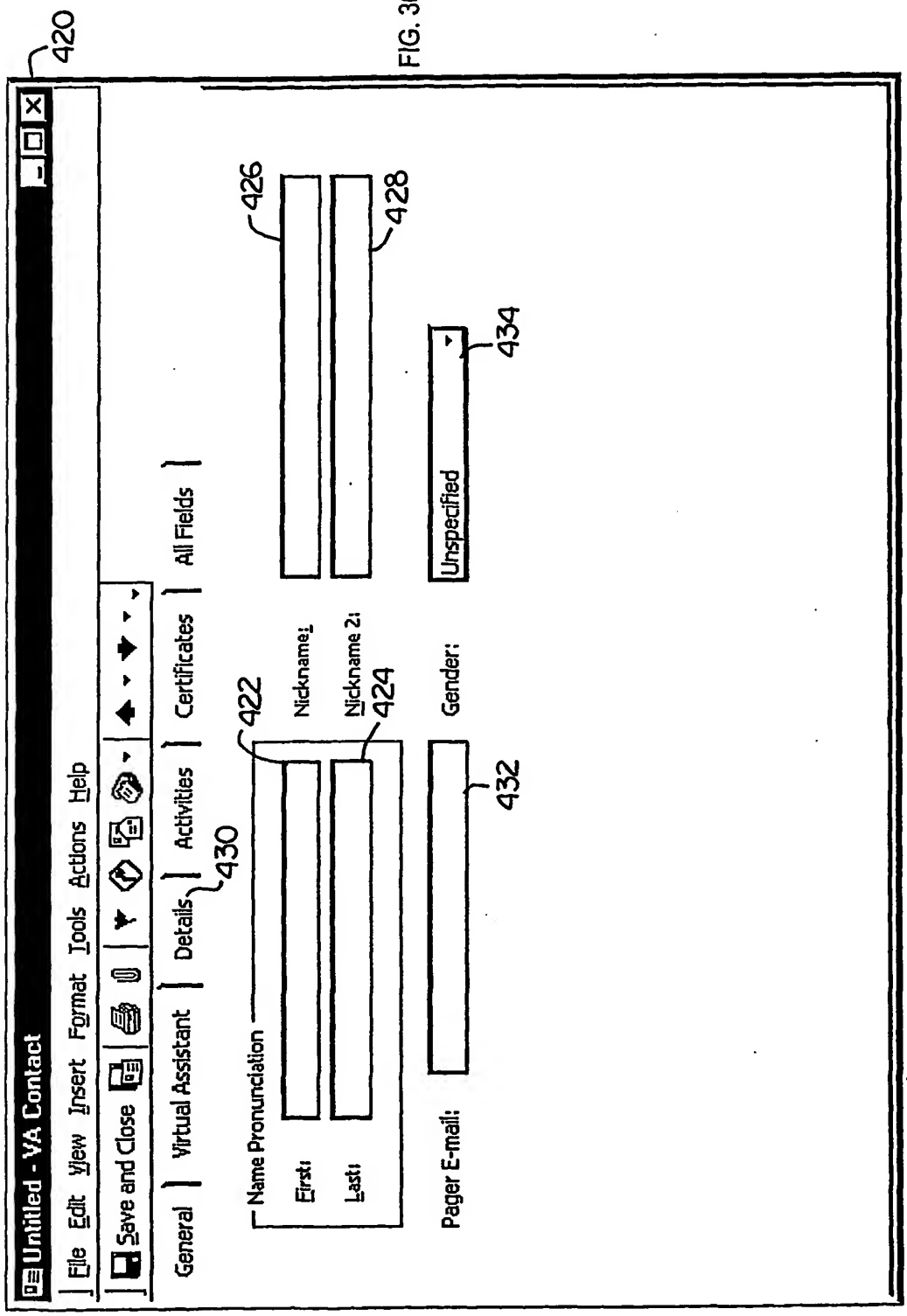

420
Untitled - YA Contact
File Edit View Insert Format Tools Actions Help
Save and Close
General Virtual Assistant Details Activities Certificates All Fields
430
Name Pronunciation
422
First:
Last:
424
Nickname:
Nickname 2:
426
428
Gender:
Unspecified
434
Pager E-mail:
432

FIG. 36

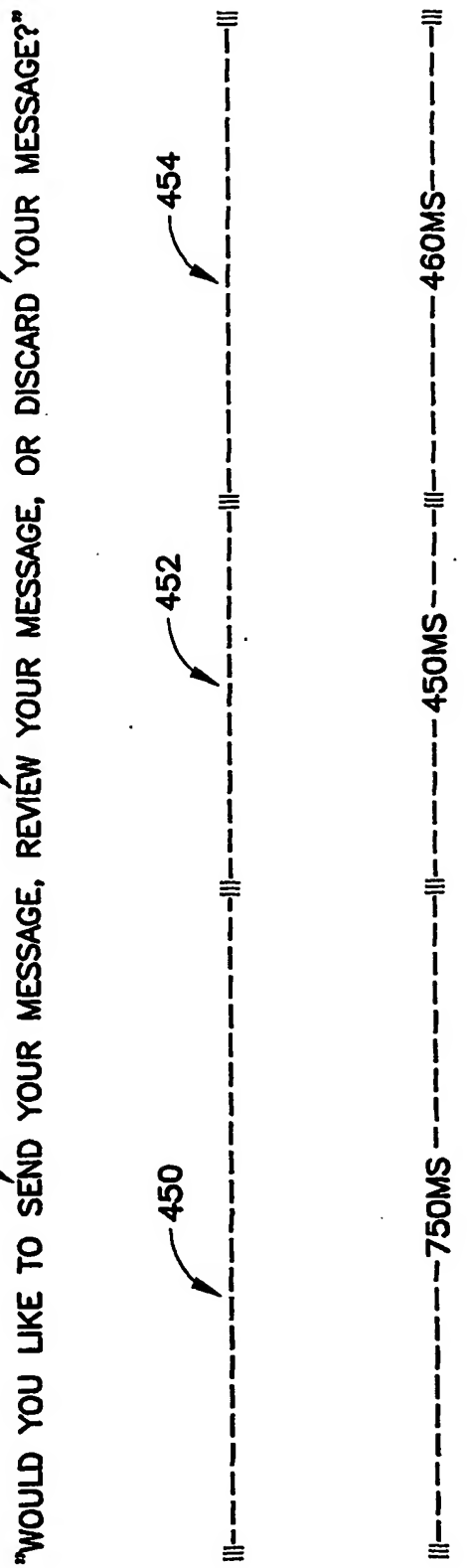

"WOULD YOU LIKE TO SEND YOUR MESSAGE, REVIEW YOUR MESSAGE, OR DISCARD YOUR MESSAGE?"
440
444
442
450
452
454
750MS
450MS
460MS

FIG. 37